LOWER PASSAIC RIVER RESTORATION PROJECT OPERABLE UNIT (OU) 4

Current Conditions Monitoring Program (CCMP)
Final Quality Assurance Project Plan (QAPP)
For
Fish and Crab Tissue Collection for Chemical Analysis

USACE Contract No. W912DQ-18-D-3008
Task Order No. F3009, ATP 01

September 23, 2019

Prepared for:
U.S. Army Corps of Engineers
Kansas City District

Prepared by:
CDM Federal Programs (CDM Smith)
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Edison, New Jersey 08837

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Acronyms List

ABS	absolute difference
ASC	analytical services coordinator
CCV	continuing calibration verification
CDM Smith	CDM Federal Programs Corporation
CIH	certified industrial hygienist
CLP	contract laboratory program
COC	chain of custody
CPG	Cooperating Parties Group
CRM	certified reference material
CRQL	contract required quantification limit
CVAFS	cold vapor atomic fluorescence spectrometry
DC	data coordinator
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DL	detection limit
DQA	data quality assessment
DQI	data quality indicator
DQO	data quality objective
DV	data validation
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ESAT	environmental services assistance team
FASTAC	Field and Analytical Services Teaming Advisory Committee
FCN	field change notification
FS	feasibility study
FTL	field team leader
GC-MS	gas chromatography-mass spectrometry
HASP	health and safety plan
Hg	mercury
HRGC	high-resolution gas chromatography
HRMS	high-resolution mass spectrometry
ICAL	initial calibration
ICP-MS	inductively coupled plasma mass spectroscopy
ICV	initial calibration verification
ID	identification
IPR	initial precision and recovery
LCS	laboratory control sample
LOQ	limit of quantitation
LPR	Lower Passaic River
LSASD	Laboratory Services and Applied Science Division
MB	method blank
MDL	method detection limit
mg/kg	milligrams per kilogram
MPC	measurement performance criteria
MRL	method reporting limit

Acronyms List (continued)

MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NELAP	National Environmental Laboratory Accreditation Program
ng/g	nanograms per gram
ng/kg	nanograms per kilogram
NJDEP	New Jersey Department of Environmental Protection
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
OC	organochlorine
OPR	ongoing precision and recovery
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PAL	project action limit
PCB	polychlorinated biphenyl
PCDD/PCDF	polychlorinated dibenzodioxin/furan
PE	performance evaluation
pg/g	picograms per gram
PM	project manager
PQL	project quantitation limit
PQLG	project quantitation limit goal
PQO	project quality objective
QA	quality assurance
QAM	quality assurance manager
QAS	quality assurance specialist
QAPP	quality assurance project plan
QC	quality control
QL	quantitation limit
r	correlation coefficient
RI	remedial investigation
RITM	remedial investigation task manager
RPD	relative percent difference
RPM	remedial project manager
RRF	relative response factor
RSCC	regional sample control coordinator
RSD	relative standard deviation
SDG	sample delivery group
SDL	sample detection limit
SM	standard method
SOP	standard operating procedure
SOW	statement of work
SSHO	site health and safety officer
TAL	Target Analyte List
TAT	turnaround time
TBD	to be determined
TM	task manager

Acronyms List (continued)

UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
VER	verification sample
VOC	volatile organic compound
ww	wet weight
°C	degrees Celsius
%	percent
%R	percent recovery
µg/kg	micrograms per kilogram
µL	microliter

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Section 1 Introduction

CDM Federal Programs Corporation (CDM Smith) received task order No. F3009, ATP 01 from the U.S. Army Corps of Engineers, Northwestern Division (USACE) contract No. W912DQ-18-D-3008. CDM Smith has been tasked to support USACE and the U.S. Environmental Protection Agency (EPA) in providing oversight of the remedial investigation (RI)/feasibility study (FS) for the Lower Passaic River (LPR) Restoration Project, Operable Unit (OU) 4, New Jersey. This task order involves oversight of the Cooperating Parties Group (CPG) RI/FS field investigation that includes field and laboratory activities, including fish and crab tissue sampling.

This quality assurance project plan (QAPP) has been prepared in accordance with the Uniform Federal Policy (UFP) QAPP manual (EPA 2005) and optimized worksheets (EPA 2012), and is compliant with EPA's QAPP requirements document EPA QA/R-5 (EPA 2001). In addition, this project will be implemented in accordance applicable CDM Smith quality procedures. This QAPP is the governing document for execution of the oversight task. CDM Smith will use various plans prepared by the CPG contractors to verify proper execution of the RI/FS.

The QAPP covers oversight tasks currently assigned to CDM Smith during the CPG fish and crab tissue sampling event.

1.1 Site Overview

On May 8, 2007, EPA announced that it had reached agreement with 73 companies considered potentially responsible for contamination in the LPR to undertake an RI/FS pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act and the Superfund Amendment and Reauthorization Act. These parties, referred to as the CPG, have retained the consultants de maximis, inc., Anchor QEA, AECOM, and Ocean Surveys, Inc. to support the CPG RI/FS effort for the lower 17.4 miles of the Passaic River.

In 2014, the CPG and their contractors completed field investigation work required to support the 2007 agreement. In December 2017, the CPG approached EPA, requesting to perform a source control interim action on the upper 9 miles (encompassing river mile 8.3 to the Dundee Dam) of the LPR. Subsequently, in an October 10, 2018 letter, EPA directed the CPG to prepare a streamlined FS for OU4 of the Diamond Alkali Site. In support of this directive, the CPG will be performing additional investigative work to establish current conditions in the upper 9 miles of LPR OU4.

1.2 Project Information and Path Forward

More than 200 years of industrialization and urbanization have resulted in large impacts to the LPR watershed, which was an important location for industry during the American Industrial Revolution (Malcolm Pirnie 2007). Industrial operations included cotton mills, manufactured gas plants, paper manufacturers, chemical manufacturers, shoemakers, and recycling facilities (Malcolm Pirnie 2007). These industries, as well as other industries developed during the late 19th and early 20th centuries, used the LPR for process water and waste disposal, which adversely affected water and sediment

quality. As a result of these historical and existing factors, sediment and water quality in the LPR are still impaired today.

The CPG-led field investigation is intended to characterize the nature and extent of contamination in sediment and surface water, which may be used to support the selection of a remedy. The oversight program is designed to provide technical review and evaluation of CPG-implemented field sampling plans. This oversight QAPP is intended to integrate the technical and quality control (QC) aspects of the oversight program and provide guidance on 2019 and 2020 field activities associated with a fish and crab tissue investigation of the LPR. This oversight QAPP details the planning processes for conducting field oversight and collecting split samples, and describes the implementation of quality assurance (QA) and QC activities for the program. The objective of CDM Smith split sample collection is to verify the accuracy of the CPG data. When required, this QAPP will be amended as 2019 and 2020 field activities/schedule are further defined.

The oversight described in this QAPP is for fish and crab tissue collection. Oversight will include field observation of the fish and crab collection. Additional oversight activities will include a review of CPG-selected sampling locations (as necessary, oversight staff will communicate with EPA and USACE on sampling locations). As part of this oversight task, CDM Smith will accept tissue split samples for the following analytes:

- Low-level polycyclic aromatic hydrocarbons (PAHs)
- Select organochlorine (OC) pesticides, including dieldrin and the following six DDX components: 2,4’-dichlorodiphenyldichloroethane (DDD), 4,4’-DDD, 2,4’-dichlorodiphenyldichloroethylene (DDE), 4,4’-DDE, 2,4’-dichlorodiphenyltrichloroethane (DDT), and 4,4’-DDT
- Polychlorinated biphenyl (PCB) congeners and homologs
- Polychlorinated dibenzodioxins/furans (PCDD/PCDF)
- Lipids
- Copper and Lead
- Total mercury (Hg)
- Methylmercury
- Percent moisture

Sampling beyond fish and crab tissue collection will be elaborated on in future QAPP addenda.

USACE Contract No. W912DQ-18-D-3008
Task Order No. F3009, ATP 01

For

LOWER PASSAIC RIVER RESTORATION PROJECT OPERABLE UNIT (OU) 4
Current Conditions Monitoring Program (CCMP)
Final Quality Assurance Project Plan (QAPP)
For Fish and Crab Tissue Collection for Chemical Analysis

Prepared for: U.S. Army Corps of Engineers

Prepared by*:* *Lauren Apakian*

Date: *September 23, 2019*

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QAPP Worksheets #1 and 2: Title and Approval Page
(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

Contract: USACE Contract No. W912DQ-18-D-3008
Task Order/Operable Unit: Task Order No. F3009, ATP 01/OU4

CDM Smith Project Manager:
David Marabello Signature_____

CDM Smith QA Manager:
Jo Nell Mullins Signature_____for_____

USACE Project Manager:
Elizabeth Franklin Signature_____

EPA Remedial Project Manager:
Diane Salkie Signature_____

EPA Quality Assurance Officer:
Bill Sy Signature_____

State regulatory agency/stakeholders (name/title/signature/date) (as applicable):
EPA, USACE, New Jersey Department of Environmental Protection (NJDEP), New Jersey Department of Transportation, National Oceanic Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service

Dates and titles of plans and reports written for previous site work, if applicable:
Quality Assurance Project Plan Hydrographic Survey Addendum. December 2018.

Quality Assurance Project Plan, Addendum #13, Chemical Water Column Monitoring Study/Small Volume Collection Water Quality Monitoring for River Mile 10.9 Removal Action. August 2013.

Quality Assurance Project Plan, Addendum #11, Chemical Water Column Monitoring Study/High Volume Chemical Data Collection Program. December 2012.

Quality Assurance Project Plan, Addendum #12, Collection of Background Surface Sediment Samples. October 2012.

Revised Final Quality Assurance Project Plan, Addendum #10, Low Resolution Coring Supplemental Sampling Program. January 2012.

QAPP Worksheets #1 and 2: Title and Approval Page
(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

Revised Final Quality Assurance Project Plan, Addendum #8, Chemical Water Column Monitoring Study/Small Volume Chemical Data Collection. November 2011.

Final Quality Assurance Project Plan, Addendum #9, River Mile 10.9 Characterization Study. August 2011.

Final Quality Assurance Project Plan, Addendum #7, Caged Bivalve Survey. May 2011.

Quality Assurance Project Plan, Final Addendum #5, Revision 1, Fish Tissue Analysis. August 2010.

Quality Assurance Project Plan, Addendum #6, Habitat Identification Survey. July 2010.

Quality Assurance Project Plan, Final Addendum #1, Avian Community Survey. July 2010.

Quality Assurance Project Plan, Final Addendum #4, Surface Sediment Samples Co-located with small Forage Fish Tissue Samples – Collected in Conjunction with Summer 2010 Benthic Community Survey. July 2010.

Final Quality Assurance Project Plan, Addendum #2, Late Spring/Early Summer 2010 Fish Community Survey. June 2010.

Quality Assurance Project Plan, Final Addendum #3, Spring and Summer 2010 Benthic Invertebrate Community Surveys. June 2010.

Final Quality Assurance Project Plan for Physical Water Column Monitoring and Generic Information for Upcoming Tasks. March 2010.

Required QAPP elements and required information that are not applicable (NA) to the project, and an explanation for their exclusions:
This is an oversight project; therefore, the CPG contractors will be collecting the samples, performing health and safety monitoring, and having responsibility for equipment calibration, inspection, and maintenance. CDM Smith will monitor field activities, receive split samples, and prepare split samples for shipment.

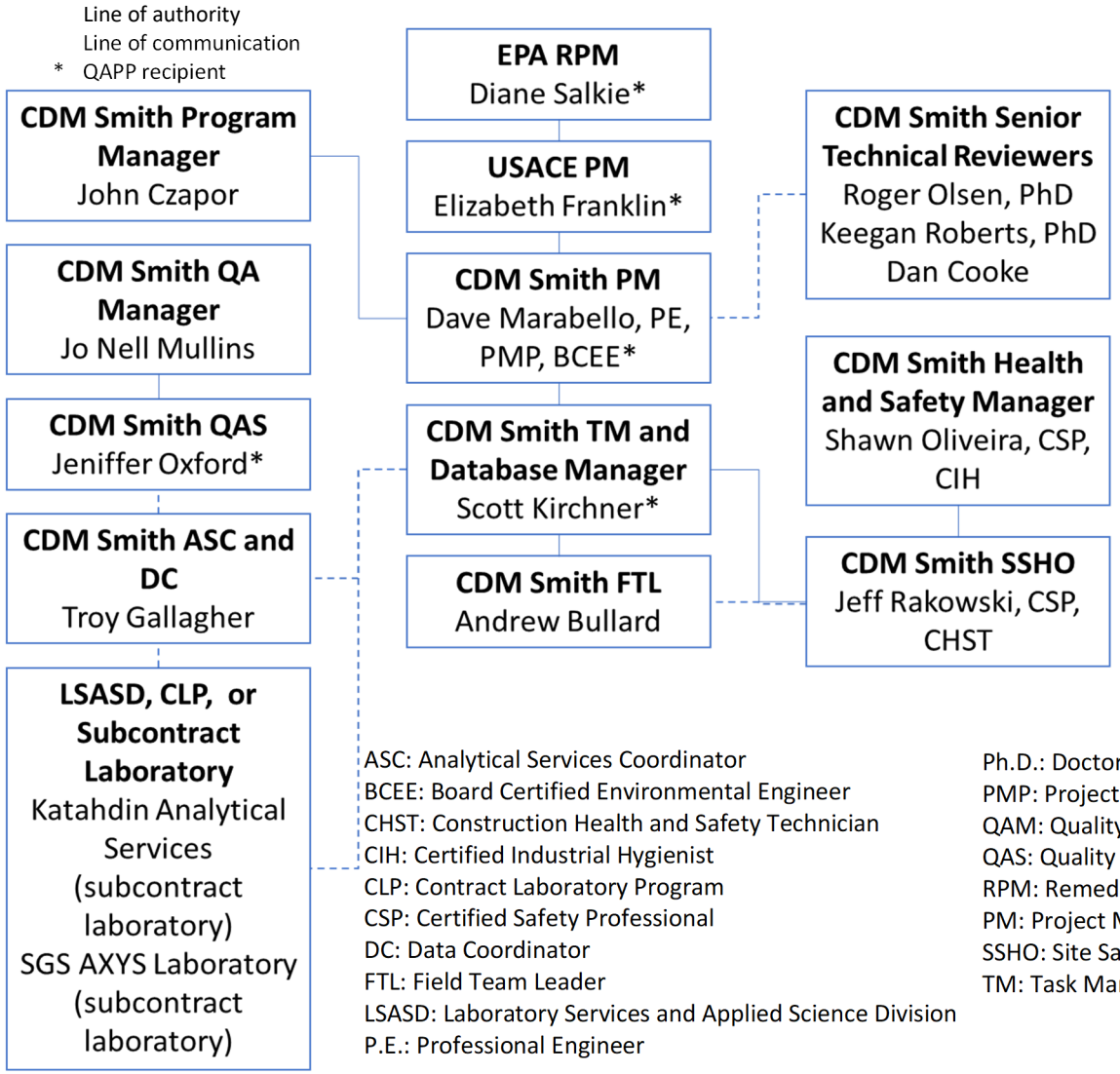
QAPP CROSSWALK
Identifying Information

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off
3 & 5	Project Organization and QAPP Distribution	2.2.3	Distribution List
		2.2.4	Project Organization and Schedule
4, 7 & 8	Personnel Qualifications and Sign-off Sheet	2.2.1	Title, Version, and Approval/Sign-Off
		2.2.7	Special Training Requirements and Certification
6	Communication Pathways	2.2.4	Project Organization and Schedule
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data
10	Conceptual Site Model	2.2.5	Project Background, Overview, and Intended Use of Data
11	Project/Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
13	Secondary Data Uses and Limitations	Chapter 3	QAPP Elements for Evaluating Existing Data
14 & 16	Project Tasks & Schedule	2.2.4	Project Organization and Schedule
15	Project Action Limits and Laboratory-Specific Detection/Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
17	Sampling Design and Rationale	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
18	Sampling Locations and Methods	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
		2.3.2	Sampling Procedures and Requirements
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements
20	Field QC	2.3.5	Quality Control Requirements
21	Field Standard Operating Procedures (SOPs)	2.3.2	Sampling Procedures and Requirements
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
23	Analytical SOPs	2.3.4	Analytical Methods Requirements and Task Description
24	Analytical Instrument Calibration	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables

QAPP CROSSWALK
Identifying Information

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation
28	Analytical Quality Control and Corrective Action	2.3.5	Quality Control Requirements
29	Project Documents and Records	2.2.8	Documentation and Records Requirements
31, 32 & 33	Assessments and Corrective Action	2.4	Assessments and Data Review
		2.5.5	Reports to Management
34	Data Verification and Validation Inputs	2.5.1	Data Verification and Validation Targets and Methods
35	Data Verification Procedures	2.5.1	Data Verification and Validation Targets and Methods
36	Data Validation Procedures	2.5.1	Data Verification and Validation Targets and Methods
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability
		2.5.3	Potential Limitations on Data Interpretation
		2.5.4	Reconciliation with Project Requirements

QAPP Worksheet #3 & 5: Project Organization and QAPP Distribution
(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA 2106-G-05 Section 2.2.3 and 2.2.4)



ASC: Analytical Services Coordinator
BCEE: Board Certified Environmental Engineer
CHST: Construction Health and Safety Technician
CIH: Certified Industrial Hygienist
CLP: Contract Laboratory Program
CSP: Certified Safety Professional
DC: Data Coordinator
FTL: Field Team Leader
LSASD: Laboratory Services and Applied Science Division
P.E.: Professional Engineer
Ph.D.: Doctor of Philosophy
PMP: Project Management Professional
QAM: Quality Assurance Manager
QAS: Quality Assurance Specialist
RPM: Remedial Project Manager
PM: Project Manager
SSHO: Site Safety and Health Officer
TM: Task Manager

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: CDM Smith

Name	Project Title/Role	Education /Experience	Specialized Training/Certifications	Signature/Date[2]
Shawn Oliveira	**Health and Safety Manager** – Oversees adherence to Health and Safety requirements	M.S., Environmental Engineering B.S., Chemistry 21 years of experience	CSP, CIH	
Jeff Rakowski	**SSHO** – Manages health and safety requirements at the site	B.S., Geography 13 years of experience	CSP, CHST	
Troy Gallagher	**ASC** – Coordinates with EPA Regional Sample Control Coordinator (RSCC), Laboratory Services and Applied Science Division (LSASD) laboratory, and subcontract laboratories **DC** – Facilitates field investigation data review and upload	B.S., Chemistry 4 years of experience		
Jo Nell Mullins	**QAM** – Develops and implements the CDM Smith QA program and assesses the implementation of the quality requirements for all projects	M.S., Environmental Health B.S., Biology/Chemistry 19 years of experience	ASQ CQA; ISO 14001 Lead Auditor Certified; Nuclear Quality Assurance-1 (NQA-1) Lead Auditor Certified	

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: CDM Smith (continued)

Name	Project Title/Role	Education /Experience	Specialized Training/Certifications	Signature/Date[2]
Jeniffer Oxford	**QAS** – Oversees adherence to QA requirements	B.S., Natural Sciences 30 years of experience		
David Marabello	**PM** – Oversees project and responds to EPA RPM and USACE PM; manages subcontractors	M.S., Environmental Engineering B.S., Chemical Engineering 30 years of experience	P.E., PMP, BCEE	
Scott Kirchner	**TM** – Oversees the field oversight activities; provides guidance on the sampling and field program; analyzes the data; and has responsibility for implementing the field activities and other tasks as applicable to project	B.S., Chemistry B.S., Environmental Science 27 years of experience	CHMM	
Scott Kirchner	**Database Manager** – Oversees data management; coordinates with validation staff	B.S., Chemistry B.S., Environmental Science 27 years of experience	CHMM	
Andrew Bullard	**FTL** – Oversees all field investigation activities	M.E.M., Environmental Management B.S., Environmental Science 22 years of experience	PMP; trained in EPA sampling methods, and field testing procedures	

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: EPA[2]

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date[2]
Diane Salkie	RPM	NA	NA	

ORGANIZATION: USACE[2]

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date[2]
Elizabeth Franklin	PM	NA	NA	

ORGANIZATION: Laboratories

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date[2]
EPA Contract Laboratory Program (CLP) laboratory[3] – to be determined (TBD)	QA Officer	TBD (Experience vetted by accreditation body)	National Environmental Laboratory Accreditation Program (NELAP)/EPA CLP	
LSASD – Sumy Cherukara	QA Officer	TBD (Experience vetted by accreditation body)	NELAP/Trained in EPA and standard analytical methods	
SGS AXYS Laboratory – TBD	QA Officer	TBD (Experience vetted by accreditation body)	NELAP	
Katahdin Analytical Services – Leslie Dimond	QA Officer	TBD (Experience vetted by accreditation body)	NELAP	

Notes:
1. Signatures indicate personnel have read and agree to implement this QAPP as written.
2. EPA headquarters staff reviews and maintains the résumés of education and experience for key laboratory staff. This information is not available for the QAPP.
3. A CLP laboratory is not used for fish and crab tissue but may be used in future QAPP addenda.

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathways, Documentation, etc.)
Regulatory agency interface	PM	David Marabello	(732) 590-4691	Send all information about the project to the EPA RPM and the USACE PM. Field changes will be discussed with the EPA RPM and USACE PM prior to implementation.
Manage field tasks	Task Manager (TM)	Scott Kirchner	(732) 590-4677	Act as liaison to PM concerning investigation activities. Daily communication with project team and PM. Communicate implementation issues to FTL.
QAPP changes: In the field	FTL	TBD		Notify TM immediately and promptly complete a Field Change Notification (FCN) form and/or corrected worksheets. Send FCN forms to the QAS.
Prior to field work During project execution	PM or TM	David Marabello or Scott Kirchner	(732) 590-4691 (732) 590-4677	Notify EPA RPM, PM, and ASC of delays or changes to field work. Prepare QAPP addendums or revisions in consultation with the client.
Field corrective actions	FTL	Andrew Bullard	(610) 263-2613	Oversee implementation of corrective action and notify PM and TM by email. Task leader will complete the corrective action report form.
Field progress reports	FTL	Andrew Bullard	(610) 263-2613	Complete daily and submit to PM and TM. PM will forward to EPA RPM upon request.
Booking of analytical services	FTL	Andrew Bullard	(610) 263-2613	Submit request to ASC before the time frame below.
	ASC	Troy Gallagher	(212) 377-4514	Coordinate LSASD analytical services through the EPA RSCC 6 weeks prior to sampling for special requests and 3 weeks prior for routine services.
Facilitate database setup and data management planning	FTL	TBD		Provide sample and analytical information prior to sample collection. Provide information on sample and analytical reporting groups and types of report tables required for project.
Facilitate data management	CDM Smith DC	Troy Gallagher	(212) 377-4514	Notify laboratory via email of incomplete or errors in data package or electronic data deliverables (EDDs). Provide data, sample identification (ID), locations, and analyses. Transmit completed sample tracking information to data manager by the completion of each sampling case.

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathways, Documentation, etc.)
Incomplete EDDs or other EDD issues	CDM Smith Data Manager, TM, or DC	Scott Kirchner Troy Gallagher	(732) 590-4677 (212) 377-4514	Personnel will request resubmittal of corrected EDD by email.
Data verification issues, e.g., incomplete records	CDM Smith FTL and DC	TBD		DC will send an email to the FTL when an issue is found. FTL will address questions or any discrepancies.
Field corrective action	CDM Smith QAS, auditor, TM, FTL, and Field Team	Jeniffer Oxford	(212) 377-4536	PM, TM, and FTL will identify corrective actions. FTL initiates corrective action on identified field issues immediately or within QAM recommended time frame.
Procurement of analytical services	FTL/ASC	Andrew Bullard Troy Gallagher	(610) 263-2613 (212) 377-4514	FTL or task leader will prepare laboratory request; ASC will review and send email to EPA RSCC. If needed, ASC will prepare an analytical statement of work (SOW) and submit for project chemist review. FTL initiates laboratory kick-off call with subcontract laboratories and emails agenda.
Analytical services support	CDM Smith ASC	Troy Gallagher	(212) 377-4514	Act as liaison with EPA RSCC for CLP laboratories (if used in QAPP addenda), with Ness Tirol for LSASD, and with subcontract laboratories.
Laboratory QC variances and analytical corrective actions	Laboratory PM or QC Officer	TBD		Daily communication with the laboratory staff and regular communication with the ASC, QAS, or designee. Provide oversight and direction on technical issues as needed.
Notification of analytical issues; sample receipt variances	CDM Smith ASC	Troy Gallagher	(212) 377-4514	Notify FTL of any sample collection/shipment issues. Notify EPA RSCC, LSASD laboratory, or subcontract laboratories to initiate corrective action.
Data validation (DV) findings, e.g., noncompliance with procedures; data review corrective actions	CDM Smith data validator or data assessor	Scott Kirchner	(732) 590-4677	Submit a list of questions or issues to EPA or the subcontract laboratory as appropriate for correction or other appropriate response.

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathways, Documentation, etc.)
Reporting of issues relating to analytical data quality (including ability to meet reporting limits and usability of data)	CDM Smith ASC or data specialist	Troy Gallagher Rebecca Farmer	(212) 377-4514 (703) 691-6578	ASC will inform PM and TM via email as appropriate. Data specialist will email ASC with any issues identified with EDDs.
	CDM Smith data administrator and data assessor	Scott Kirchner Vanessa Macwan	(732) 590-4677 (732) 225-7000	Communicate via email to PM and TM as appropriate. Document situation and effect in a data quality report prepared prior to preparing the oversight report.
Release of analytical data	CDM Smith ASC	Troy Gallagher	(212) 377-4514	Receive and review data packages for completeness before data is validated and uploaded to database. Initiate DV of subcontract laboratory data and provide notification to project team when data manager releases data for use.
Site health and safety issues; stop work due to safety issues	CDM Smith SHSO	Jeff Rakowski	(732) 590-4665	Make decisions regarding health and safety issues and upgrading personal protective equipment. Communicate to PM, TM, Health and Safety Manager, and field staff as appropriate.

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Projected Date(s) of Sampling: Summer/Fall 2019 **CDM Smith Site Manager:** David Marabello	**Site Name:** Diamond Alkali OU4 **Site Location:** LPRSA
Date of Planning Session: 4/11/19, 4/18/19, 5/28/19, and 6/13/19	
Scoping Session Purpose: The CPG presented its proposal for the Current Conditions Biota Sampling to EPA/Partner Agencies	

Name	Affiliation	E-mail Address
EPA Team		
Michael Sivak	EPA	Sivak.michael@epa.gov
Diane Salkie	EPA	salkie.diane@epa.gov
Chuck Nace	EPA	Nace.Charles@epa.gov
Beth Franklin	USACE	Elizabeth.A.Franklin@usace.army.mil
Andrew Bullard	CDM Smith	bullardak@cdmsmith.com
Jonathan Clough	Warren Pinnacle	jclough@warrenpinnacle.com
Dan Cooke	CDM Smith	cookedw@cdmsmith.com
Aaron Frantz	CDM Smith	FrantzAR@cdmsmith.com
Ed Garland	HDR/EPA Consultant	edward.garland@hdrinc.com
John Kern	Kern Statistical Services	jkern@KernStat.com
Scott Kirchner	CDM Smith	kirchnersf@cdmsmith.com
Keegan Roberts	CDM Smith	robertsk@cdmsmith.com
James Wands	HDR	james.wands@hdrinc.com
NJDEP Team		
Anne Hayton	NJDEP	Anne.hayton@dep.nj.gov
Jay Nickerson	NJDEP	jay.nickerson@dep.nj.gov
Myla Ramirez	NJDEP	Myla.Ramirez@dep.nj.gov
John Wolfe	LimnoTech	jwolfe@limno.com
CPG Team		
Robert Law	de maximis, inc.	rlaw@demaximis.com

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Name	Affiliation	E-mail Address
Bill Potter	de maximis, inc.	otto@demaximis.com
Gary Fisher	CPG	gary.fisher@nokia.com
Doug Reid-Green	CPG	douglas.reid-green@basf.com
Kristen Durocher	AECOM	Kristen.Durocher@aecom.com
Sue Harden	AECOM	susan.harden@aecom.com
John Connolly	Anchor QEA	jconnolly@anchorqea.com
Jim Rhea	Anchor QEA	jrhea@anchorqea.com
Mark LaRue	Anchor QEA	mlarue@anchorqea.com
Peter Israelsson	Anchor QEA	pisraelsson@anchorqea.com
Mike Johns	Windward Environmental	MikeJ@windwardenv.com
Lisa Saban	Windward Environmental	lisas@windwardenv.com

Comments/Decisions: The CPG presented its proposal for the Current Conditions Monitoring Program to EPA, NJDEP, and their consultants. EPA and NJDEP were generally in agreement on the fish and crab tissue collection scope, and discussions focused on the scope of the chemical monitoring of water, sediment, and biota. A follow-up meeting was scheduled for and held on April 17, 2019.

Projected Date(s) of Sampling: Summer/Fall 2019 **Project Manager:** David Marabello	**Site Name:** Diamond Alkali OU4 **Site Location:** LPRSA
Date of Planning Session: 4/17/2019	
Scoping Session Purpose: Discuss the scope of the water monitoring component of the Current Conditions Monitoring Program	

Name	Affiliation	E-mail Address
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QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

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QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Name	Affiliation	E-mail Address
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Comments/Decisions: The CPG discussed details for the Current Conditions Biota Sampling Program with EPA, NJDEP, and their consultants. EPA and NJDEP determined the number of tissue samples to collect during the 2-year period over which sampling will occur, the level of effort, the sampling areas, the target species, and the analyses to perform. EPA requested the inclusion of age analysis of all fish in order to support the evaluation of the bioaccumulation model. The CPG accepted this request.

QAPP Worksheet #10: Conceptual Site Model
(UFP-QAPP Manual Section 2.5.2)
(EPA 2106-G-05 Section 2.2.5)

Refer to the CPG QAPP for information on the conceptual site model and data quality objectives (DQOs). The CPG will support the RI/FS by establishing current conditions in regard to biota sampling in the LPR and gathering data for further calibration of the bioaccumulation model.

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

The CPG QAPP will address project DQOs. Split samples will be used to support goals of the oversight program. The problem and framework for oversight are as follows:

1. **State the Problem**

   The CPG is leading the fish and crab tissue investigation; EPA and USACE need to determine the accuracy of CPG-generated data and ensure work is executed in compliance with approved documents. Oversight will include field observation and acceptance of split samples to verify site characterization.

   CDM Smith will assist EPA and USACE in oversight of CPG activities by providing field oversight and analysis of split samples from the CPG contractor to verify compliance with its approved project plants and accuracy of its data. To evaluate CPG data accuracy, CDM Smith will accept approximately 5 percent (%) of split samples for analysis at locations determined by coordination with the CPG and in consultation with the USACE PM and EPA RPM.

   CDM Smith oversight of the CPG field investigation will include the following activities:

   - Technical review and evaluation of the CPG project plans and reports
   - Documentation of field activities observations and deviations from approved plans
   - Acceptance of split samples
   - Sample handling, packaging, and shipping to off-site laboratories
   - Review of CPG-selected sampling locations
   - Comparison of data sets to determine any analytical bias

2. **Identify Study Goals**

   The data will be used to verify, through independent oversight and split sampling analysis, that the CPG activities are in accordance with the CPG QAPP and health and safety plan (HASP) and that the CPG data are representative of the site conditions and contaminant concentrations. Oversight and split sample data will be used to answer the environmental questions below:

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

- Is the CPG contractor complying with approved plans and approved deviations?
- Do the CPG data adequately characterize the site, and are the data representative and useful for project decisions?
- Are the CPG and CDM Smith data complete and accurate?
- Are the data sets comparable, as defined on Worksheet #37?
- Do the data show any analytical bias?
- Do CPG data and CDM Smith data have relative percent differences (RPDs) within specified measurement performance criteria (MPC)?

3. Identify Information Inputs

The primary required data types will be analytical results of fish and crab tissue collected from the LPR. Tissue samples will be analyzed for PAHs, OC pesticides (DDDs, DDEs, DDTs and dieldrin), PCDD/PCDF, PCB congeners and homologs, copper, lead, trace level total mercury, methylmercury, lipids, and percent moisture during tissue sampling.

CDM Smith, in consultation with the USACE PM and EPA RPM, will determine sample locations to be split. CDM Smith will accept samples during the CPG field program and send them to a subcontract laboratory for analysis. The data generated will be used to assess data accuracy and compliance with the governing documents and overall project scope. The oversight data will be used to answer the study questions listed in Step 2 above.

4. Define the Boundaries of the Study

CDM Smith will only be accepting split samples during the field investigation activities at a frequency of approximately 5%. Sample locations will be determined in consultation with the USACE PM and EPA RPM. Samples selected for split sampling data will cover a range of locations and concentrations and critical items, such as areas of potential contamination. Samples will be accepted from each media type collected by the CPG.

Sampling oversight will be performed according to the CPG schedule.

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

5. Determine the Analytical Approach

Oversight will include field observations and split sample acceptance for analysis of PAHs, PCDD/PCDF, PCB congeners and homologs, OC pesticides (DDDs, DDEs, DDTs, and dieldrin), copper, lead, total mercury, methylmercury, lipids, and percent moisture.

Split data results will enable CDM Smith to evaluate the CPG field program analytical data, and qualitatively assess any potential bias in the CPG data set. Sample results will be evaluated against the CPG project quantitation limits (PQLs) on Worksheet #15 and against the CPG data using split sample data quality indicators (DQIs) on Worksheets #12 and #28. Field implementation will be measured against procedures in the CPG field plans. The project decision criteria below will apply.

6. Project Decision Conditions ("If…, then..." statements)

- If the field work is inconsistent with the CPG QAPP and field sampling plans, then field oversight staff will verify tasks with respect to the CPG QAPP and HASP and note deviations with the CPG field project leader and document such discussions in the Periodic Field Summary Reports sent to USACE and EPA. The CDM Smith PM, USACE PM, and EPA RPM will be informed if there are deviations from the work plan and/or CPG QAPP.
- If the CPG team needs to relocate field sample locations or if there are any changes to the planned field program, then CDM Smith will communicate this change to the USACE PM and EPA RPM and document it on the Daily Field Summary Reports.

CDM Smith will present data findings to USACE and EPA, who will determine if any additional actions are required.

7. Select Performance and Acceptance Criteria

- CDM Smith QC data will be used to determine split samples data quality and whether sample results are acceptable based on the established project DQOs. Sample results will be compared to the MPC of the data quality indicators.
- Laboratory analysis will be performed through the subcontract laboratory.
- Definitive level data are required for full validation of the data.

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

- Project-specific quantitation limits are specified on Worksheet #15 for analyses to be conducted during tissue sampling. Analytical data generated will be compared against these limits. Data must meet the DQOs that have been specified for the site. Refer to Worksheets #12, #15, and #28.
- Laboratory quantitation limits are anticipated to be low enough for comparison of the split samples to the CPG data set.
- To verify MPC for usability (criteria for measures of precision, accuracy, representativeness, comparability, completeness, and sensitivity) are met, all data will be subject to validation and the outputs will be used to perform a data usability assessment.

8. Detailed Plan of Obtaining Data

Field sampling and field procedures are described in the CPG QAPP. See the CPG figure in the oversize figures for potential split sample locations.

CPG contractor representatives will collect and fill the sample containers, and CDM Smith field personnel will prepare the split samples for shipment. CDM Smith will perform sample management and prepare, package, and ship the split samples to the assigned laboratories. The subcontract laboratories will generate the data. EPA RSCC will communicate laboratory assignments to CDM Smith.

CDM Smith field personnel will observe implementation of field and sampling activities and note any deviations from the CPG QAPP. Deviations will be brought to the attention of the CPG contractor and reported to the CDM Smith PM, who will communicate this information to the USACE PM and EPA RPM. These deviations will be documented in daily communications and in the CDM Smith oversight report. The oversight report will include a discussion of the impact of the deviations on the data quality. The CPG contractor's activities will be documented in the field logbook.

Data Reporting

- Field observations will be recorded using field oversight forms provided in Appendix C.
- Sampling data results will be sent by the subcontract laboratory via email or an online web portal for evaluation and preparation of a data comparability report.

QAPP Worksheet #11: Project Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

- Following completion of laboratory analyses and receipt of all electronic and hard copy data, results will be presented in CDM Smith-generated reports. Report(s) will include tabulated results and a discussion of the data quality and its comparability with the CPG data. This review will be used to evaluate the accuracy of the CPG data.

Data Archiving

- COC information will be uploaded to the EPA Sample Management Office website for archiving and transmittal of information.
- Data generated by the subcontract laboratory will be e-mailed to CDM Smith and USACE within the specified 21-day turnaround time (TAT).
- Data will be verified and validated in accordance with Worksheets #34, #35, and #36.
- Verified and validated electronic analytical data will be uploaded to the Passaic River/Newark Bay EQuIS Enterprise Database.

  Records and documents will be maintained for the period specified in the contract.

QAPP Worksheet #12: Measurement Performance Criteria Table Listing
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

ORGANICS – Tissue:

- PAHs by EPA 8270 Modified **(12a)**
- Select OC Pesticides by EPA 1699 **(12b)**
- PCB Congeners by 1668A **(12c)**
- PCDD/PCDF by EPA 1613B **(12d)**

INORGANICs – Tissue:

- Metals (Copper and Lead) – Inductively Coupled Plasma Mass Spectroscopy (ICP-MS) by EPA SW-846-6020 **(12e)**
- Total Mercury by EPA Method 1631 **(12f)**
- Methylmercury by EPA 1630 **(12g)**

GENERAL CHEMISTRY – Tissue:

- Percent Lipid by Method 1613 **(12h)**
- Percent Moisture by SM 2540 G Modified **(12i)**

QAPP Worksheet #12a: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Tissue
Analytical Group PAHs by EPA 8270 Modified
Concentration Level Low

DQIs	QC Sample or Measurement Performance Activity	MPC
Overall Precision	Field duplicate and split samples	RPD ≤40% if both samples are >10 × sample detection limit (SDL) or absolute difference (ABS) < quantitation limit (QL)
Analytical Precision	Laboratory duplicate	RPD ≤20% of mean if concentration >10 × SDL
Analytical Accuracy/Bias	Ongoing precision and recovery (OPR) standard	60–140 %R for target analytes (see SOP for individual limits) 15–130 %R for labeled compounds (see SOP for individual limits)
Analytical Accuracy/Bias	Matrix spike (MS)/matrix spike duplicate (MSD)	50–200 %R, RPD ≤50%
Accuracy (preservation)	Temperature blank checks evaluated during DV	0–6°C
Analytical Accuracy/Bias	Surrogate*	15–130 %R for labeled compounds (see SOP for individual limits)
Analytical Accuracy/Bias	SRM/certified reference material (CRM)	25% of reference values with two exceptions up to 50%, applicable for values that are 3× the concentration of the lowest calibration point of ICAL
Analytical Accuracy/Bias	Method blank (MB)/instrument blank	No target compound > limit of quantitation (LOQ) (meet LOQ on Worksheet #15 and laboratory SOP)
Overall Accuracy/Bias-Contamination	Equipment blank	No target compound > LOQ (meet limits on Worksheet #15 and laboratory SOP)
Comparability	Evaluated in data quality assessment (DQA)	Comparable units and methods
Completeness	Data completeness check DQA	≥90% collection and analysis

Notes:
1. The laboratory must perform and meet all the QA requirements specified in MLA-021.
*Surrogates are pure analytes added to every blank, sample, MS/MSD, and standard in known amounts before extraction or other processing; used to evaluate analytical efficiency by measuring recovery.

QAPP Worksheet #12b: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Tissue
Analytical Group OC Pesticides by EPA 1699
Concentration Level Low

DQIs	QC Sample or Measurement Performance Activity	MPC
Overall Precision	Field duplicate and split samples	RPD ≤40% if both results are >10 × SDL ABS ≤ QL
Analytical Precision	MS/MSD	NA
Analytical Accuracy/Bias	OPR standard	70–130 %R for target analytes, except dieldrin 60–130 %R 40–150 %R for labeled compounds, except dieldrin 30–150 %R
Analytical Accuracy/Bias	MS	NA
Analytical Accuracy/Bias	Performance evaluation (PE) sample	25% of reference values with one exception up to 50%, applicable for values that are 3× the concentration of the lowest calibration points of ICAL
Analytical Accuracy/Bias	Surrogates	40–150 %R for labeled compounds, except dieldrin 30–150 %R Specific surrogates selected by laboratory
Accuracy (preservation)	Temperature blank checks evaluated during DV	0–6°C
Comparability	Assessed during DQA	Comparable units and methods
Completeness	Data completeness check	≥90%
Overall Accuracy/Bias-Contamination	Equipment blank	No target compound > LOQ (meet QLs on Worksheet #15 and laboratory SOP)

Note:
1. The laboratory must perform and meet all the QA requirements specified in MLA-028 including performance of initial and ongoing studies, calibration verification, addition of internal standards, analyses of blanks, and determination of detection limits.

QAPP Worksheet #12c: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Tissue
Analytical Group PCB Congeners by EPA 1668A
Concentration Level Low

DQIs	QC Sample or Measurement Performance Activity	MPC
Overall Precision	Field duplicate and split samples	RPD ≤40% if both concentrations ≥10× SDL, otherwise ABS < QL
Analytical Precision	Initial precision and recovery (IPR)	Relative standard deviation (RSD) ≤40% for targets and RSD ≤50% for labeled compounds
Analytical Precision	Laboratory duplicate	±20% of mean if concentration >10 × SDL
Analytical Accuracy/Bias	CRM/QC check sample	25% of reference values with two exceptions up to 50%, applicable for values that are 3× the concentration of the lowest calibration points of ICAL
Analytical Accuracy/Bias	Calibration verification sample (VER)	Per laboratory or method SOP, 70–130% for native analytes and 50–150 %R for labeled compounds
Analytical Accuracy/Bias	IPR standard	60–140 %R 20–135 %R for labeled compounds (see SOP for individual limits)
Analytical Accuracy/Bias	OPR standard	50–150 %R for target analytes and 15–140 %R for labeled compounds (see SOP for individual limits)
Analytical Accuracy/Bias	Labeled compound recovery in samples	15–150 %R (see SOP for individual limits)
Accuracy (preservation)	Temperature blank checks during DV	0–6°C
Comparability	Assessed during DQA	Comparable units, and methods
Completeness	Assessed during DQA	≥90% collection and analysis
Overall Accuracy/Bias	Equipment blanks	≤ LOQs (meet QLs on Worksheet #15 and laboratory SOP)

Note:
1. The assigned laboratory must perform and meet all the QA requirements specified in the method.

QAPP Worksheet #12d: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Tissue
Analytical Group PCDD/PCDF by EPA 1613B
Concentration Level Low

DQIs	QC Sample or Measurement Performance Activity	MPC
Overall Precision	Field duplicate and split samples	RPD ≤40% if both sample and duplicate concentrations ≥ 10 × SDL QL, otherwise ABS ≤ QL
Analytical Precision	Laboratory duplicate	±20% of mean if concentration >10 × SDL
Analytical Accuracy/Bias Precision	Laboratory control sample (LCS)/laboratory control sample duplicate	Per laboratory – not prepared by all laboratories
Accuracy (preservation)	Temperature blank checks during DV	0–6°C
Analytical Precision	IPR standard	Per laboratory SOP
Analytical Accuracy/Bias		Various %R per laboratory SOP
Analytical Accuracy/Bias	OPR standard labeled compounds	70–130 %R for target analytes (see SOP for individual limits) 25–150 %R for labeled compounds
Comparability	Evaluated during DQA	Comparable units, and methods
Completeness	Evaluated during DQA	≥90% collection and analysis
Analytical Accuracy/Bias	MBs assessed during DV and DQA	≤ LOQs (meet limits on Worksheet #15 and laboratory SOP)
Overall Accuracy/Bias	Equipment blanks – assessed during DV and DQA	≤ LOQs (meet QLs on Worksheet #15 and laboratory SOP)

Note:
1. The assigned laboratory must perform and meet all the QA requirements specified in the method.

QAPP Worksheet #12e: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Tissue

Analytical Group Metals (Copper and Lead) by ICP-MS by EPA SW-846 6020
(Note: laboratory TBD)

Concentration Level ICP-MS; Low (micrograms per liter)

DQIs	QC Sample or Measurement Performance Activity	MPC
Accuracy/Bias	MB	No target compound > QL
Accuracy/Bias	Equipment blanks	No target compound > QL
Accuracy/Bias	LCS	75–125 %R
Accuracy/Bias	MS	75–125 %R
Accuracy/Bias	CRM	Vendor-provided limits
Precision	Matrix duplicate	75–125 %R; RPD ≤30%
Completeness	Assessed during DQA	≥90% collection and analysis

QAPP Worksheet #12f: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Tissue
Analytical Group Trace Level Total Mercury by EPA 1631
(Note: laboratory TBD)
Concentration Level Low

DQIs	QC Sample or Measurement Performance Activity	MPC
Accuracy/Bias	MBs	Average MB <2 × method reporting limit (MRL) and standard deviation < MDL or < 0.1 × the concentration of project samples
Accuracy/Bias	Equipment blanks	No target compound > QL
Accuracy/Bias	CRM	75–125 %R
Analytical Precision Analytical Accuracy	MS/MSD	70–130 %R RPD ≤30%
Precision	Matrix duplicate	RPD ≤30% or 2x MRL if results ≤5x MRL
Completeness	Assessed during DQA	≥90% collection and analysis

QAPP Worksheet #12g: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Tissue
Analytical Group Methylmercury by EPA 1630 (Note: laboratory TBD)
Concentration Level Low

Data Quality Indicators	QC Sample or Measurement Performance Activity	MPC
Accuracy/Bias	MBs	MB ≤2 × MDL, standard deviation ≤2/3 MDL or 1/10 of associated sample concentration
Accuracy/Bias	Equipment blanks	No target compound > QL
Accuracy/Bias	CRM	Within 35% of certified value
Accuracy/Bias	MS/MSD	65–135 %R, RPD ≤35%
Precision	Method duplicate	RPD ≤35% or ±2 × MRL if samples <5 × MRL
Completeness	Evaluated during DQA	≥90%

QAPP Worksheet #12h: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Tissue
Analytical Group Percent Lipids
Concentration Level Low

DQIs	QC Sample or Measurement Performance Activity	MPC
Overall Precision	Field duplicate and split samples	RPD ≤40% if both sample and duplicate concentrations 10 × SDL QL, otherwise ABS ≤ QL
Analytical Precision	Laboratory duplicate	RPD ≤20%
Analytical Accuracy/Bias	OPR standard	80–120 %R of canola oil
Accuracy (preservation)	Temperature blank checks during DV	0–6°C
Comparability	Evaluated during DQA	Comparable units, and methods
Completeness	Evaluated during DQA	≥90% collection and analysis
Analytical accuracy/bias	MBs assessed during DV and DQA	≤ LOQs (meet limits on Worksheet #15 and laboratory SOP)
Overall accuracy/bias	Equipment blanks – assessed during DV and DQA	≤ LOQs (meet QLs on Worksheet #15 and laboratory SOP)
Sensitivity	Sample results reviewed in DQA	Sample LOQs meet PQLGs or PALs on Worksheet #15 at a minimum

Note:

1. The assigned laboratory must perform and meet all the QA requirements specified in the method SOP.

QAPP Worksheet #12i: Measurement Performance Criteria Table
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix Tissue
Analytical Group Percent Moisture by SM 2540 G Modified
Concentration Level NA

DQIs	QC Sample or Measurement Performance Activity	MPC
Precision	Matrix duplicate	RPD <20%
Completeness	Data completeness check	>90%

QAPP Worksheet #13: Secondary Data Criteria and Limitations Table
(UFP-QAPP Manual Section 2.7)
(EPA 2106-G-05 Chapter 3: QAPP Elements for Evaluating Existing Data)

Data Type	Data Source	Data Use Relative to Current Project	Factors affecting the Reliability of Data and Limitations on Data Use
Fish Community Survey Data	Windward Environmental. 2010. Fish and Decapod Field Report for the Late Summer/Early Fall 2009 Field Effort. September 14, 2010. Windward Environmental. 2011. Fish Community Survey and Tissue Collection Data Report for the Lower Passaic River Study Area 2010 Field Efforts. July 20, 2011.	Fish community survey data used to inventory fish populations in the upper (i.e., freshwater) portion of the LPR study areas and to select appropriate species for tissue residue analysis.	There are no limitations on use of the data.
Fish Tissue Data	Windward Environmental. 2018a. 2009 Fish and Blue Crab Tissue Chemistry Data for the Lower Passaic River Study Area. Windward Environmental. 2018b. 2010 Small Forage Fish Tissue Chemistry Data for the Lower Passaic River Study Area.	Fish/crab tissue chemistry data used to select appropriate species for tissue residue analysis and estimate appropriate target sample sizes; fish/crab catch data (e.g., species collected, size range, methods of collection) were used to inform sampling design.	There are no limitations on use of the data.
	Windward Environmental. 2019. 2012 Background Fish Chemistry Data.	Fish catch data (species collected, size range, method of collection, and timing) used to inform sampling design.	There are no limitations on use of the data.
Predicted Tide Tables	NOAA online tide data available at (https://tidesandcurrents.noaa.gov/)	To determine how much line slack will be needed for placement of fishing gear, and to identify possible areas that may be exposed for beach seining efforts.	Raw tidal elevation data obtained from the NOAA website have not been subjected to the National Ocean Service's (NOS) QC or QA procedures and do not meet the criteria and standards of official NOS data. They have been released for limited public use as preliminary data to be used only with appropriate caution.

QAPP Worksheet #14 & 16: Project Tasks & Schedule
(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

Activity	Responsible party	Description	Deliverable(s)	Deliverable Due Date
Draft QAPP	CDM Smith	Prepare and submit draft version of the oversight QAPP to EPA and USACE	Draft QAPP	August 2019
Final QAPP	CDM Smith	Prepare and submit final version of the oversight QAPP to EPA and USACE	Final QAPP	August 2019
QAPP Addenda	CDM Smith	Prepare and submit QAPP addendums as appropriate	QAPP Addenda	TBD
Laboratory Assignment	CDM Smith	Submit Analytical Services Request forms	Subcontract laboratories and EPA laboratory assignments	TBD
Field Oversight	CDM Smith	Oversight of fish and crab tissue collection field activities	Summary report of field observations, including pictures	TBD
Split Samples	CDM Smith	Collection of split samples and submission for analysis	Samples obtained per oversight QAPP shipped to assigned laboratories	Split samples will be collected during the CPG-implemented field sampling program starting September 2019.
Laboratory Analysis	Subcontract Laboratory	Analysis of the collected split samples	Data package	TBD, dependent on CPG schedule; for standard analyses, 21 days after last sample is received; specialized analyses may take additional time
Data Validation	CDM Smith	Validation and verification of sample data	Validated data report	21 days after last sample is received
Oversight/Data Evaluation	CDM Smith	Evaluation of the CPG-collected data and comparison against CDM Smith-collected split samples	Oversight summary report/data quality summary report	TBD

QAPP Worksheet #15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

ORGANICS – Tissue:

- PAHs by EPA 8270 Modified **(15a)**
- Select OC Pesticides by EPA 1699 **(15b)**
- PCB Congeners by 1668A **(15c)**
- PCDD/PCDF by EPA 1613B **(15d)**

INORGANICs – Tissue:

- Metals (Copper and Lead) – ICP-MS by EPA SW-846 6020 **(15e)**
- Trace Level Total Mercury by EPA Method 1631 **(15f)**
- Methylmercury by EPA 1630 **(15g)**

GENERAL CHEMISTRY – Tissue:

- Percent Lipid by EPA 1613 **(15h)**
- Percent Moisture by SM 2540 G Modified **(15i)**

QAPP Worksheet #15a: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PAHs by EPA 8270C/D Modified
Concentration Level: Low (micrograms per kilogram [µg/kg])

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
Acenaphthene	None	NA	TBD	0.1	0.501
Acenaphthylene	None	NA	TBD	0.1	0.492
Anthracene	None	NA	TBD	0.1	0.501
Fluorene	None	NA	TBD	0.1	0.492
Naphthalene	None	NA	TBD	0.1	0.711
Phenanthrene	None	NA	TBD	0.1	0.505
Benzo[a]anthracene	None	NA	TBD	0.1	0.503
Benzo[a]pyrene	None	NA	TBD	0.1	0.500
Benzo[b]fluoranthene	None	NA	TBD	0.1	0.504
Benzo[e]pyrene	None	NA	TBD	0.1	0.500
Benzo[g,h,i]perylene	None	NA	TBD	0.1	0.493
Benzo[k]fluoranthene	None	NA	TBD	0.2	0.504
Chrysene	None	NA	TBD	0.1	0.502
Dibenzo[a,h]anthracene	None	NA	TBD	0.2	0.493
Fluoranthene	None	NA	TBD	0.1	0.495
Indeno(1,2,3-cd)pyrene	None	NA	TBD	0.2	1.003
Pyrene	None	NA	TBD	0.1	0.495

Notes:

1. Typical SDLs and LOQs are limits obtained by the SGS AXYS Laboratory based on extraction and analysis of a 10-gram sample to 100 microliters (µL) final volume, and are based on a 6-point calibration curve. QLs must be supported by the low-level standard in the calibration curve. Actual SDLs and QLs achieved will be sample-specific, accounting for all sample preparation and analysis factors (e.g., actual volume of sample analyzed and any dilution used for sample analysis). LOQ is based on 40 CFR Part 136, Appendix B, Revision 2. The laboratory will report detected results between the SDL and LOQ, qualified as estimated "J" data. Nondetected results will be reported at the SDL.

QAPP Worksheet #15b: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: Chlorinated Pesticides by EPA 1699
Concentration Level: Low (nanograms per gram [ng/g]) or (µg/kg)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
Dieldrin	None	NA	TBD	0.05	0.324
4,4'-DDE	None	NA	TBD	0.02	0.196
2,4'-DDE	None	NA	TBD	0.02	0.162
4,4'-DDD	None	NA	TBD	0.02	0.194
2,4'-DDD	None	NA	TBD	0.02	0.161
4,4'-DDT	None	NA	TBD	0.02	0.162
2,4'-DDT	None	NA	TBD	0.02	0.160

Notes:

1. Typical SDLs and LOQs are limits obtained by SGS AXYS Laboratory based on extraction and analysis of a 10-gram sample to 200 µL final volume, and are based on 6-point calibration curve. QLs must be supported by the low-level standard in the calibration curve. Actual SDLs and QLs achieved will be sample-specific accounting for all sample preparation and analysis factors (e.g., actual volume of sample analyzed and any dilution used for sample analysis). LOQ is based on 40 CFR Part 136, Appendix B, Revision 2. The laboratory will report detected results between the SDL and LOQ, qualified as estimated "J" data. Nondetected results will be reported at the SDL.

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 1	None	NA	TBD	0.1	3.0
PCB 2	None	NA	TBD	0.1	3.0
PCB 3	None	NA	TBD	0.1	3.0
PCB 4	None	NA	TBD	0.2	3.0
PCB 5	None	NA	TBD	0.2	3.0
PCB 6	None	NA	TBD	0.2	3.0
PCB 7	None	NA	TBD	0.2	3.0
PCB 8	None	NA	TBD	0.2	3.0
PCB 9	None	NA	TBD	0.2	3.0
PCB 10	None	NA	TBD	0.2	3.0
PCB 11	None	NA	TBD	0.2	6.2
PCB 12 (coelutes with PCB 13)	None	NA	TBD	0.2	3.0
PCB 13 (Coelutes with PCB 12)	None	NA	TBD	C12	C12
PCB 14	None	NA	TBD	0.2	3.0
PCB 15	None	NA	TBD	0.2	3.0
PCB 16	None	NA	TBD	0.1	3.0
PCB 17	None	NA	TBD	0.1	3.0
PCB 18 (Coelutes with PCB 30)	None	NA	TBD	C30	C30
PCB 19	None	NA	TBD	0.1	3.0
PCB 20 (Coelutes with PCB 28)	None	NA	TBD	C28	C28

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 21 (Coelutes with PCB 33)	None	NA	TBD	0.1	3.0
PCB 22	None	NA	TBD	0.1	3.0
PCB 23	None	NA	TBD	0.1	3.0
PCB 24	None	NA	TBD	0.1	3.0
PCB 25	None	NA	TBD	0.1	3.0
PCB 26 (Coelutes with PCB 29)	None	NA	TBD	0.1	3.0
PCB 27	None	NA	TBD	0.1	3.0
PCB 28 (Coelutes with PCB 20)	None	NA	TBD	0.1	3.0
PCB 29 (Coelutes with PCB 26)	None	NA	TBD	C26	C26
PCB 30 (Coelutes with PCB 18)	None	NA	TBD	0.1	3.0
PCB 31	None	NA	TBD	0.1	3.0
PCB 32	None	NA	TBD	0.1	3.0
PCB 33 (Coelutes with PCB 21)	None	NA	TBD	C21	C21
PCB 34	None	NA	TBD	0.1	3.0
PCB 35	None	NA	TBD	0.1	3.0
PCB 36	None	NA	TBD	0.1	3.0
PCB 37	None	NA	TBD	0.1	3.0
PCB 38	None	NA	TBD	0.1	3.0
PCB 39	None	NA	TBD	0.1	3.0
PCB 40 (Coelutes with PCB 41 and 71)	None	NA	TBD	0.1	3.0
PCB 41(Coelutes with PCB 40 and 71)	None	NA	TBD	C40	C40
PCB 42	None	NA	TBD	0.1	3.0
PCB 43	None	NA	TBD	0.1	3.0
PCB 44 (Coelutes with PCB 47 and 65)	None	NA	TBD	0.1	3.0
PCB 45 (Coelutes with PCB 51)	None	NA	TBD	0.1	3.0

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 46	None	NA	TBD	0.1	3.0
PCB 47 (Coelutes with PCB 44 and 65)	None	NA	TBD	C44	C44
PCB 48	None	NA	TBD	0.1	3.0
PCB 49 (Coelutes with PCB 69)	None	NA	TBD	C69	C69
PCB 50 (Coelutes with PCB 53)	None	NA	TBD	0.1	3.0
PCB 51(Coelutes with PCB 45)	None	NA	TBD	C45	C45
PCB 52	None	NA	TBD	0.1	3.0
PCB 53 (Coelutes with PCB 50)	None	NA	TBD	C50	C50
PCB 54	None	NA	TBD	0.1	3.0
PCB 55	None	NA	TBD	0.1	3.0
PCB 56	None	NA	TBD	0.1	3.0
PCB 57	None	NA	TBD	0.1	3.0
PCB 58	None	NA	TBD	0.1	3.0
PCB 59 (Coelutes with PCB 62 and 75)	None	NA	TBD	0.1	3.0
PCB 60	None	NA	TBD	0.1	3.0
PCB 61 (Coelutes with PCB 70, 74 and 76)	None	NA	TBD	0.1	3.0
PCB 62 (Coelutes with PCB 59 and 75)	None	NA	TBD	C59	C59
PCB 63	None	NA	TBD	0.1	3.0
PCB 64	None	NA	TBD	0.1	3.0
PCB 65 (Coelutes with PCB 44 and 47)	None	NA	TBD	C44	C44

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 66	None	NA	TBD	0.1	3.0
PCB 67	None	NA	TBD	0.1	3.0
PCB 68	None	NA	TBD	0.1	3.0
PCB 69 (Coelutes with PCB 49)	None	NA	TBD	0.1	3.0
PCB 70 (Coelutes with PCB 61, 74, and 76)	None	NA	TBD	C61	C61
PCB 71 (Coelutes with PCB 40 and 41)	None	NA	TBD	C40	C40
PCB 72	None	NA	TBD	0.1	3.0
PCB 73	None	NA	TBD	0.1	3.0
PCB 74 (Coelutes with PCB 61, 70, and 76)	None	NA	TBD	C61	C61
PCB 75 (Coelutes with PCB 59 and 62)	None	NA	TBD	C59	C59
PCB 76 (Coelutes with PCB 61, 70, and 74)	None	NA	TBD	C61	C61
PCB 77	None	NA	TBD	0.1	3.0
PCB 78	None	NA	TBD	0.1	3.0
PCB 79	None	NA	TBD	0.1	3.0
PCB 80	None	NA	TBD	0.1	3.0
PCB 81	None	NA	TBD	0.1	3.0
PCB 82	None	NA	TBD	0.1	3.0
PCB 83 (Coelutes with PCB 99)	None	NA	TBD	0.1	3.0
PCB 84	None	NA	TBD	0.1	3.0
PCB 85 (Coelutes with PCB 116 and 117)	None	NA	TBD	C117	C117
PCB 86 (Coelutes with PCB 87, 97, 108, 119, and 125)	None	NA	TBD	C108	C108
PCB 87 (Coelutes with PCB 86, 97, 108, 119, and 125)	None	NA	TBD	C108	C108

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 88 (Coelutes with PCB 91)	None	NA	TBD	0.1	3.0
PCB 89	None	NA	TBD	0.1	3.0
PCB 90 (Coelutes with PCB 101 and 113)	None	NA	TBD	C113	C113
PCB 91 (Coelutes with PCB 88)	None	NA	TBD	C88	C88
PCB 92	None	NA	TBD	0.1	3.0
PCB 93 (Coelutes with 95, 98, 100, and 102)	None	NA	TBD	C95	C95
PCB 94	None	NA	TBD	0.1	3.0
PCB 95 (Coelutes with 93, 98, 100, and 102)	None	NA	TBD	0.1	3.0
PCB 96	None	NA	TBD	0.1	3.0
PCB 97 (Coelutes with PCB 86, 87, 108, 119, and 125)	None	NA	TBD	C108	C108
PCB 95 (Coelutes with 93, 98, 100, and 102)	None	NA	TBD	0.1	3.0
PCB 96	None	NA	TBD	0.1	3.0
PCB 97 (Coelutes with PCB 86, 87, 108 ,119, and 125)	None	NA	TBD	C108	C108
PCB 98 (Coelutes with 93, 95, 100, and 102)	None	NA	TBD	C95	C95
PCB 99 (Coelutes with PCB 83)	None	NA	TBD	C83	C83
PCB 100 (Coelutes with 93, 95, 98, and 102)	None	NA	TBD	C95	C95
PCB 101 (Coelutes with PCB 90 and 113)	None	NA	TBD	C113	C113
PCB 102 (Coelutes with 93, 95, 98, and 100)	None	NA	TBD	C95	C95
PCB 103	None	NA	TBD	0.1	3.0
PCB 104	None	NA	TBD	0.1	3.0

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 105	None	NA	TBD	0.1	3.0
PCB 106	None	NA	TBD	0.1	3.0
PCB 107 (Coelutes with PCB 124)	None	NA	TBD	0.1	3.0
PCB 108 (Coelutes with PCB 86, 87, 97, 119, and 125)	None	NA	TBD	0.1	3.0
PCB 109	None	NA	TBD	0.1	3.0
PCB 110 (Coelutes with PCB 115)	None	NA	TBD	0.1	3.0
PCB 111	None	NA	TBD	0.1	3.0
PCB 112	None	NA	TBD	0.1	3.0
PCB 113 (Coelutes with PCB 90 and 101)	None	NA	TBD	0.1	3.0
PCB 114	None	NA	TBD	0.1	3.0
PCB 115 (Coelutes with PCB 110)	None	NA	TBD	C110	C110
PCB 116 (Coelutes with PCB 85 and 117)	None	NA	TBD	C117	C117
PCB 117 (Coelutes with PCB 85 and 116)	None	NA	TBD	0.1	3.0
PCB 118	None	NA	TBD	0.1	3.0
PCB 119 (Coelutes with PCB 86, 87, 97, 108, and 125)	None	NA	TBD	C108	C108
PCB 120	None	NA	TBD	0.1	3.0
PCB 121	None	NA	TBD	0.1	3.0
PCB 122	None	NA	TBD	0.1	3.0
PCB 123	None	NA	TBD	0.1	3.0
PCB 124 (Coelutes with PCB 107)	None	NA	TBD	C107	C107
PCB 125 (Coelutes with PCB 86, 87, 97, 108, and 119)	None	NA	TBD	C108	C108

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 126	None	NA	TBD	0.1	3.0
PCB 127	None	NA	TBD	0.1	3.0
PCB 128 (Coelutes with PCB 166)	None	NA	TBD	0.1	3.0
PCB 129 (Coelutes with PCB 138, 160, and 163)	None	NA	TBD	C138	C138
PCB 130	None	NA	TBD	0.1	3.0
PCB 131	None	NA	TBD	0.1	3.0
PCB 132	None	NA	TBD	0.1	3.0
PCB 133	None	NA	TBD	0.1	3.0
PCB 134 (Coelutes with PCB 143)	None	NA	TBD	0.1	3.0
PCB 135 (Coelutes with PCB 151 and 154)	None	NA	TBD	C151	C151
PCB 136	None	NA	TBD	0.1	3.0
PCB 137	None	NA	TBD	0.1	3.0
PCB 138 (Coelutes with PCB 129, 160, and 163)	None	NA	TBD	0.1	3.0
PCB 139 (Coelutes with PCB 140)	None	NA	TBD	0.1	3.0
PCB 140 (Coelutes with PCB 139)	None	NA	TBD	C139	C139
PCB 141	None	NA	TBD	0.1	3.0
PCB 142	None	NA	TBD	0.1	3.0
PCB 143 (Coelutes with PCB 134)	None	NA	TBD	C134	C134
PCB 144	None	NA	TBD	0.1	3.0

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 145	None	NA	TBD	0.1	3.0
PCB 146	None	NA	TBD	0.1	3.0
PCB 147 (Coelutes with PCB 149)	None	NA	TBD	0.1	3.0
PCB 148	None	NA	TBD	0.1	3.0
PCB 149 Coelutes with PCB 147)	None	NA	TBD	C147	C147
PCB 150	None	NA	TBD	0.1	3.0
PCB 151 (Coelutes with PCB 135 and 154)	None	NA	TBD	0.1	3.0
PCB 152	None	NA	TBD	0.1	3.0
PCB 153 (Coelutes with PCB 168)	None	NA	TBD	0.1	3.0
PCB 154 (Coelutes with PCB 135 and 151	None	NA	TBD	C151	C151
PCB 155	None	NA	TBD	0.1	3.0
PCB 156 (Coelutes with PCB 157)	None	NA	TBD	0.1	3.0
PCB 157 (Coelutes with PCB 157)	None	NA	TBD	C156	C156
PCB 158	None	NA	TBD	0.1	3.0
PCB 159	None	NA	TBD	0.1	3.0
PCB 160 (Coelutes with PCB 129, 138, and 163)	None	NA	TBD	C138	C138
PCB 161	None	NA	TBD	0.1	3.0
PCB 162	None	NA	TBD	0.1	3.0
PCB 163 (Coelutes with PCB 129, 138, and 160)	None	NA	TBD	C138	C138
PCB 164	None	NA	TBD	0.1	3.0
PCB 165	None	NA	TBD	0.1	3.0
PCB 166 (Coelutes with PCB 128)	None	NA	TBD	C128	C128
PCB 167	None	NA	TBD	0.1	3.0

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 168 (Coelutes with PCB 153)	None	NA	TBD	C153	C153
PCB 169	None	NA	TBD	0.1	3.0
PCB 170	None	NA	TBD	0.1	3.0
PCB 171 (Coelutes with PCB 173)	None	NA	TBD	0.1	3.0
PCB 172	None	NA	TBD	0.1	3.0
PCB 173 Coelutes with PCB 171)	None	NA	TBD	C171	C171
PCB 174	None	NA	TBD	0.1	3.0
PCB 175	None	NA	TBD	0.1	3.0
PCB 176	None	NA	TBD	0.1	3.0
PCB 177	None	NA	TBD	0.1	3.0
PCB 178	None	NA	TBD	0.1	3.0
PCB 179	None	NA	TBD	0.1	3.0
PCB 180 (Coelutes with PCB 193)	None	NA	TBD	0.1	3.0
PCB 181	None	NA	TBD	0.1	3.0
PCB 182	None	NA	TBD	0.1	3.0
PCB 183 (Coelutes with PCB 185)	None	NA	TBD	0.1	3.0
PCB 184	None	NA	TBD	0.1	3.0
PCB 185 (Coelutes with PCB 183)	None	NA	TBD	C183	C183
PCB 186	None	NA	TBD	0.1	3.0
PCB 187	None	NA	TBD	0.1	3.0

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
PCB 188	None	NA	TBD	0.1	3.0
PCB 189	None	NA	TBD	0.1	3.0
PCB 190	None	NA	TBD	0.1	3.0
PCB 191	None	NA	TBD	0.1	3.0
PCB 192	None	NA	TBD	0.1	3.0
PCB 193 (Coelutes with PCB 180)	None	NA	TBD	C180	C180
PCB 194	None	NA	TBD	0.1	3.0
PCB 195	None	NA	TBD	0.1	3.0
PCB 196	None	NA	TBD	0.1	3.0
PCB 197 (Coelutes with PCB 200)	None	NA	TBD	0.1	3.0
PCB 198 (Coelutes with PCB 199)	None	NA	TBD	0.1	3.0
PCB 199 (Coelutes with PCB 198)	None	NA	TBD	C198	C198
PCB 200 Coelutes with PCB 197)	None	NA	TBD	C197	C197
PCB 201	None	NA	TBD	0.1	3.0
PCB 202	None	NA	TBD	0.1	3.0
PCB 203	None	NA	TBD	0.1	3.0
PCB 204	None	NA	TBD	0.1	3.0
PCB 205	None	NA	TBD	0.1	3.0
PCB 206	None	NA	TBD	0.1	3.0
PCB 207	None	NA	TBD	0.1	3.0
PCB 208	None	NA	TBD	0.1	3.0
PCB 209	None	NA	TBD	0.1	3.0
Monochlorobiphenyl	None	NA	TBD	Note 2	Note 2
Dichlorobiphenyl	None	NA	TBD	Note 2	Note 2
Trichlorobiphenyl	None	NA	TBD	Note 2	Note 2

QAPP Worksheet #15c: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits (UFP-QAPP Manual Section 2.6.2.3 and Figure 15) (EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCB Congeners by EPA 1668A
Concentration Level: Low picograms per gram(pg/g)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
Tetrachlorobiphenyl	None	NA	TBD	Note 2	Note 2
Pentachlorobiphenyl	None	NA	TBD	Note 2	Note 2
Hexachlorobiphenyl	None	NA	TBD	Note 2	Note 2
Heptachlorobiphenyl	None	NA	TBD	Note 2	Note 2
Octachlorobiphenyl	None	NA	TBD	Note 2	Note 2
Nonachlorobiphenyl	None	NA	TBD	Note 2	Note 2

Notes:

1. Typical SDLs and LOQs are limits obtained by SGS AXYS Laboratory based on extraction and analysis of a 10-gram sample to 20 µL final volume, and are based on 6-point calibration curve. QLs must be supported by the low-level standard in the calibration curve. Actual SDLs and QLs achieved will be sample-specific accounting for all sample preparation and analysis factors (e.g., actual volume of sample analyzed and any dilution used for sample analysis). LOQ is based on 40 CFR Part 136, Appendix B, Revision 2. The laboratory will report detected results between the SDL and LOQ, qualified as estimated "J" data. Nondetected results will be reported at the SDL.
2. The laboratory will report individual PCB congeners or PCB coelutions and will calculate PCB homologue and Total PCB concentrations based on individual PCB congeners.
3. The limits above were provided by the laboratory.

QAPP Worksheet #15d: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCDD/PCDF by EPA 1613B
Concentration Level: Low (ng/kg)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	None	NA	TBD	0.05	2.0
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	None	NA	TBD	0.05	2.0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	None	NA	TBD	0.05	1.0
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	None	NA	TBD	0.05	1.0
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	None	NA	TBD	0.05	1.0
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	None	NA	TBD	0.05	1.0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	None	NA	TBD	0.05	1.0
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	None	NA	TBD	0.05	1.0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	None	NA	TBD	0.05	1.0
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	None	NA	TBD	0.05	1.0
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	None	NA	TBD	0.05	1.0

QAPP Worksheet #15d: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: PCDD/PCDF by EPA 1613B
Concentration Level: Low (ng/kg)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	None	NA	TBD	0.05	1.0
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	None	NA	TBD	0.05	1.0
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	None	NA	TBD	0.05	1.0
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	None	NA	TBD	0.05	0.4
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	None	NA	TBD	0.05	0.8
Total HpCDF	None	NA	TBD	Note 2	Note 2
Total HpCDD	None	NA	TBD	Note 2	Note 2
Total HxCDF	None	NA	TBD	Note 2	Note 2
Total HxCDD	None	NA	TBD	Note 2	Note 2
Total PeCDF	None	NA	TBD	Note 2	Note 2
Total PeCDD	None	NA	TBD	Note 2	Note 2
Total TCDF	None	NA	TBD	Note 2	Note 2
Total TCDD	None	NA	TBD	Note 2	Note 2

Notes:

1. Typical SDLs and LOQs are limits obtained by SGS AXYS Laboratory based on extraction and analysis of a 10-gram sample to 20 µL final volume, and are based on 6-point calibration curve. QLs must be supported by the low-level standard in the calibration curve. Actual SDLs and QLs achieved will be sample-specific accounting for all sample preparation and analysis factors (e.g., actual volume of sample analyzed, and any dilution used for sample analysis). LOQ is based on 40 CFR Part 136, Appendix B, Revision 2. The laboratory will report detected results between the SDL and LOQ, qualified as estimated "J" data. Nondetected results will be reported at the SDL.
2. Total congeners concentrations determined by calculation.

QAPP Worksheet #15e: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits (UFP-QAPP Manual Section 2.6.2.3 and Figure 15) (EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: Target Analyte List (TAL) Metals by ICP-MS by EPA SW-846 6020 (Note: laboratory TBD)
Concentration Level: Low (milligrams per kilogram [mg/kg] wet weight [ww])

Analyte	PAL	PAL Reference	PQLG	Method Detection Limit (MDL)[1]	QL[1]
Copper	NA	NA	5.41	0.0334	0.01
Lead	NA	NA	1.5	0.00582	0.04

Note:
1. Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual MDLs and QLs will vary based on sample-specific factors.

QAPP Worksheet #15f: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: Trace Level Total Mercury by EPA 1631 (Note: laboratory TBD)
Concentration Level: Low (mg/kg ww)

Analyte	PAL	PAL Reference	PQLG	MDL[1]	QL[1]
Mercury	NA	NA	0.0086	0.00016	0.0004

Note:
1. Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual MDLs and QLs will vary based on sample-specific factors.

QAPP Worksheet #15g: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: Low level Mercury by EPA 1631 (Note: laboratory TBD)
Concentration Level: Low (mg/kg ww)

Analyte	PAL	PAL Reference	PQLG	MDL[1]	QL[1]
Methylmercury	NA	NA	0.0086	0.0015	0.003

Note:
1. Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual MDLs and QLs will vary based on sample-specific factors.

QAPP Worksheet #15h: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: Percent Lipids by EPA 1613
Concentration Level: Trace (%)

Analyte	PAL	PAL Reference	PQLG	SDL	LOQ
Lipids	None	NA	TBD	NA	NA

QAPP Worksheet #15i: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Tissue
Analytical Group: Percent Moisture by SM 2540 G Modified
Concentration Level: NA

Analyte	PAL	PAL Reference	PQLG	MDL	QL
Percent Moisture	NA	NA	NA	NA	NA

QAPP Worksheet #17: Sampling Design and Rationale
(UFP-QAPP Manual Section 3.1.1)
(EPA 2106-G-05 Section 2.3.1)

Describe and provide a rationale for choosing the sampling approach:

As part of the project, the CPG is implementing an investigation and field sampling program in support of an RI/FS or other investigation. On behalf of the EPA, CDM Smith will provide oversight and will accept and analyze split samples. The oversight program is designed to provide technical review and evaluation of associated CPG-implemented QAPPs. Worksheet #10 states the oversight activities to occur during the field sampling programs, and Worksheet #11 provides details on the collection of split samples. Oversight forms are provided in Appendix C.

Oversight will include field observation of fish and crab collection for use in characterizing the concentrations of chemicals present in LPR biota. Additional oversight will include a review of CPG-selected sampling locations (as necessary, oversight staff will communicate with EPA and USACE on sampling locations).

CDM Smith will accept split samples at a rate of approximately 5% to ensure the CPG data are accurate. Samples for laboratory processing will be transported to Alpha Analytical in coolers, on ice, with the original CPG COCs generated in the field. After the compositing scheme is approved by USEPA and CPG, Windward will oversee the initial process and compositing at Alpha Analytical. Alpha Analytical will process samples according to its SOP identified in the CPG's tissue sampling QAPP. Fish and crab specimens not included in a composite or used whole body (filet and carcass) will be disposed of once analysis and validation of the composite samples are complete. USEPA will be notified prior to the disposal of these specimens. After samples have been processed and/or composited, new COC forms will be generated by Alpha Analytical and will accompany all sample shipments.

Once all tissue samples are processed the available mass for each sample will be listed in a summary table of samples. This summary table will be shared with EPA for selection of split samples. The split samples will be selected to cover the range of available species/classes and locations were the specimens were collected. If the mass available for a desired split sample is insufficient for all analyses described under this QAPP the following hierarchy will be followed.

Order of split sample collection: dioxin/furan, PCB, pesticide, mercury, PAHs, metals, methyl mercury, and moisture. If sample mass is not available for moisture analysis the results from CPG's moisture analysis will be used to correct any wet weight results. These data will be qualified as estimated and comment added to the data.

QAPP Worksheet #17: Sampling Design and Rationale
(UFP-QAPP Manual Section 3.1.1)
(EPA 2106-G-05 Section 2.3.1)

Field activities will be conducted according to the Technical SOPs below:

Describe the sampling action and rationale in terms of matrix to be sampled and frequency (including seasonal considerations); sampling locations (including QC, critical, and background samples); analytical groups and concentration; number of samples to be taken:

Sampling and analysis rationale, matrices to be sampled, and analytical group are summarized in Worksheet #18.

Decontamination procedures
Equipment decontamination procedures will be implemented by the CPG in accordance with its QAPP and HASP. CDM Smith will follow the updated accident prevention plan, including the HASP included as an appendix.

Field procedures for these activities are detailed in:

- Technical SOP 1-2 Sample Custody
- Technical SOP 2-1 Packaging and Shipping Environmental Samples
- Technical SOP 4-1 Field Logbook Content and Control
- Technical SOP 4-2 Photographic Documentation of Field Activities
- Data Management Plan

CDM Smith Technical SOPs are included in Appendix B.

QAPP Worksheet #18: Sampling Locations and Methods
(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.1 and 2.3.2)

Sample ID	*Matrix*	*Sampling Area*	*Type*	*Analyte/Analytical Group*	*Sampling SOP*	*Comments*
Refer to QAPP prepared by Windward Environmental for the CPG	Tissue	Refer to QAPP prepared by Windward Environmental for the CPG	Grab	32 composite split samples for for PCDD/PCDF, PCB (homologs and congeners), lipids, percent moisture, TAL metals, total mercury, methylmercury, OC pesticides, PAHs, and age, plus 2 duplicates (one per 20 samples)	Refer to QAPP prepared by Windward Environmental for the CPG	Refer to QAPP prepared by Windward Environmental LLC for the CPG, Worksheet #18 for sampling locations and monitoring event schedule.

Over the course of the study, the CPG is collecting approximately 312 composite samples for split samples for for PCDD/PCDF, PCB (homologs and congeners), lipids, percent moisture, TAL metals, total mercury, methylmercury, OC pesticides, PAHs, and age during sampling. Approximately 5% of split samples for each analysis will be accepted during sampling over an approximately three week sampling period. Samples will be collected from two sections on the LPR (river mile 8.3–15 and river mile 15 to Dundee Dam), with sampling locations distributed throughout these areas to ensure good spatial coverage.

Per the CPG fish and crab tissue collection QAPP, samples will be collected at each location based on habitat and accessibility. Three fish or crab per composite (or five fish per composite for sunfish) will be collected at each location. Split samples will be accepted from varied sampling locations. Samples will be named according to the QAPP prepared by Anchor QEA for the CPG; split samples will be designated by the addition of -CDM at end of each sample ID.

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Laboratory: Subcontract laboratory – TBD
List any required accreditations/certifications: provided upon procurement of laboratory
Sample Delivery Method: FedEx Overnight

Analyte/ Analyte Group	Matrix	Analytical and Preparation Method/SOP[1,2]	Accreditation Expiration Date	Container(s)[3] (number, size, and type per sample)	Preservation[4]	Preparation Holding Time[5]	Analytical Holding Time[6]	Data Package Turnaround Time
SGS AXYS Laboratory								
PAHs	Tissue	EPA Method 8270 Modified or equivalent/MLA-021 Rev. 12 Ver. 06	Provided upon procurement of laboratory	Minimum mass = 60g (Combined mass for PAHs, Pesticides, PCBs and PCDD/PCDF) (1) 4-oz amber glass jar	Freeze sample: 0˚C to -20°C	14 days to extraction	40 days to analysis For this study samples can be stored 299 days if frozen; 40 days to extraction	TAT is 21 days for analysis, 21 days for DV
OC Pesticides		EPA 1699 / MLA-028 Rev. 06 Ver. 10				14 days to extraction	40 days to analysis For this study samples can be stored 299 days if frozen; 40 days to extraction	
PCB Congeners		EPA 1668A				1 year for solid multiphase samples, if stored at less than -10°C	1 year for sample extracts, if stored at less than -10°C	
PCDD/PCDF		EPA 1613B for high-resolution gas chromatography (HRGC)/ high-resolution mass spectrometry (HRMS)/ MLA-017 Rev.20 Ver.10				1 year for solid multiphase samples, if stored at less than -10°C.	1 year for sample extracts, if stored at less than -10°C	

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Laboratory: Subcontract laboratory – TBD
List any required accreditations/certifications: provided upon procurement of laboratory
Sample Delivery Method: FedEx Overnight

Analyte/ Analyte Group	Matrix	Analytical and Preparation Method/SOP[1]	Accreditation Expiration Date	Container(s)[2] (number, size, and type per sample)	Preservation[3]	Preparation Holding Time[4]	Analytical Holding Time[5]	Data Package Turnaround Time
Percent Moisture	Tissue	SM 2540 G Modified	SGS AXYS Laboratory	Minimum mass = 10g (1) 4-oz amber glass jar	Freeze sample: 0˚C to -20°C	1 year if frozen	TBD	TAT is 21 days for analysis, 21 days for DV
Lipids		EPA 1613B/MLA-017 Rev.20 Ver.10		No extra additional mass required		TBD	TBD	
Katahdin Analytical Services								
TAL Metals	Tissue	EPA SW-846 6020	Provided upon procurement of laboratory	Minimum mass = 10g (1) 4-oz amber glass jar	Freeze sample: 0°C to -20°C	1 year if frozen	TBD	TAT is 21 days for analysis, 21 days for DV
Methylmercury		EPA 1630		Minimum mass = 10g (1) 4-oz amber glass jar			TBD	
Trace Level Total Mercury		EPA 1631		Minimum mass = 10g (1) 4-oz amber glass jar			TBD	

Notes:

[1] Subcontract laboratory SOPs to be provided upon procurement of laboratory.

[2] Only one sample container will be submitted to each laboratory. When multiple analyses are conducted at any given laboratory, the aliquots for each analysis will be taken from the single sample container. Container size may be modified at the discretion of the laboratory to accommodate small sample masses. The smallest container size should be selected; however, volume increases due to expansion of water upon freezing must be accounted for to avoid breaking the container upon freezing.

[3] Tissue samples for chemical analyses will be frozen upon collection and thawed or partially thawed for processing and homogenization. After homogenization, tissues will be refrozen in containers for shipment to the analytical laboratories. Tissues will remain frozen until extraction/preparation for analysis. When frozen samples for chemical analysis are couriered, ice will be used as a preservative.

[4] Bottleware and preservatives for split sample acceptance to be provided by subcontractor laboratory. Sample volume may be limited; CDM Smith will communicate with the EPA RSCC or the subcontract laboratory to prioritize analysis or to combine bottleware where applicable. Actual bottleware may vary based on discussions with subcontract laboratory to achieve limits specified on Worksheet #15.

[5] Holding times are in calendar days. Any remaining tissue mass will be archived frozen.

QAPP Worksheet #20: Field Quality Control Summary
(UFP-QAPP Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.5)

Matrix	Analyte/Analyte Group	Method/SOP	Field Samples	Field Duplicate	MS/MSD	Field Equipment Blanks	Trip Blanks	Other	Total
SGS AXYS Laboratory									
Tissue	PAHs	EPA 8270C Modified or equivalent (SGS AXYS Laboratory SOP)	Minimum 16 split samples	1 per 20 field samples	1 MS 1 MSD (1 per 20 field samples)	0	0	0	19
Tissue	OC Pesticides	EPA 1699 (SGS AXYS Laboratory SOP)	Minimum 16 split samples	1	1 MS 1 MSD (1 per 20 field samples)	0	0	0	19
Tissue	PCB Congeners	EPA 1668A for HRGC/HRMS (SGS AXYS Laboratory SOP)	Minimum 16 split samples	1	1 MS 1 MSD (1 per 20 field samples)	0	0	0	19
Tissue	PCDD/PCDF	EPA 1613B for HRGC/HRMS (SGS AXYS Laboratory SOP)	Minimum 16 split samples	1	1 MS 1 MSD (1 per 20 field samples)	0	0	0	19
Tissue	Percent Moisture	SM 2540 G Modified	Minimum 16 split samples	1	0	0	0	0	17
Tissue	Lipids	EPA 1613B (SGS AXYS Laboratory SOP)	Minimum 16 split samples	1	0	0	0	0	17

QAPP Worksheet #20: Field Quality Control Summary
(UFP-QAPP Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.5)

Matrix	Analyte/ Analyte Group	Method/SOP	Field Samples	Field Duplicate	MS/MSD[1]	Field Equipment Blanks	Trip Blanks[2]	Other	Total
Katahdin Analytical Services									
Tissue	TAL Metals	EPA SW-846 6020 (Laboratory TBD)	Minimum 16 split samples	1	1 MS 1 MSD (1 per 20 field samples)	0	0	0	19
Tissue	Methylmercury	EPA 1630 (Laboratory TBD)	Minimum 16 split samples	1	1 MS 1 MSD (1 per 20 field samples)	0	0	0	19
Tissue	Total Mercury	EPA 1631 (Laboratory TBD)	Minimum 16 split samples	1	1 MS 1 MSD (1 per 20 field samples)	0	0	0	19

Notes:

[1] After homogenization, sample masses will be reviewed and samples will be selected for matrix-specific QC samples (MD, MS, and MSD) and EPA split samples. Matrix-specific QC samples will be analyzed at a rate of approximately 1 sample per 20 per matrix type (unless the analytical method requires more) as sample mass permits. In order to have enough mass for QC samples, sample mass must be at least three times the post-homogenization minimum target mass.

[2] Trip blanks will not be collected because they are not applicable to solid samples.

QAPP Worksheet #21: Field SOPs
(UFP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

SOP # or Reference	Title, Revision, Date, and URL (if available)	Originating Organization	SOP Option or Equipment Type (if SOP provides different options)	Modified for Project? Y/N	Comments
1-2	Sample Custody, Rev. 8, February 2015	CDM Smith	NA	Y	-Sample tags are not required. -Distribution of chain-of-custody (COC) forms per EPA Region 2 guidelines. -Use waterproof ink for any handwritten labels.
2-1	Packaging and Shipping Environmental Samples, Rev. 6, February 2015	CDM Smith	NA	Y	- If wrapping material is placed around the label, write the sample number and analysis on the outside of the wrap and place in a ziptop bag and close. -Vermiculite shall not be used. Include cooler temperature blank.
4-1	Field Logbook Content and Control, Rev. 8, February 2015	CDM Smith	Digital Camera	Y	Logbook notes should include decontamination procedures and equipment used, descriptions of photographs taken, problems encountered, and notes of conversations with pertinent project team members. Details of samples acceptance including equipment used and visual observations.
4-2	Photographic Documentation of Field Activities, Rev. 9, February 2015	CDM Smith	NA	N	Comments can include details about the activity or modifications.

[1] Bottleware and preservatives for split sample acceptance provided by subcontractor laboratory.

[2] For each sample collected and shipped the following information will be recorded (at a minimum) in the field logbook:

- Name of field personnel
- CDM Smith assigned sample number/location
- Date sampled and date shipped
- Sample location number
- Corresponding laboratory sample number
- Media type and analysis to be performed
- Sample volume and containers; preservatives added to sample
- Any unusual discoloration or evidence of contamination
- Field parameter measurements and calculations
- Courier airbill number and means of delivery to the laboratory
- General observations

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.1.2.4)
(EPA 2106-G-05 Section 2.3.6)

Field Equipment	Activity	SOP Reference	Title or Position of Responsible Person	Frequency	Acceptance Criteria	Corrective Action
NA – equipment calibration, maintenance, testing, and inspection will be performed by the CPG contractor						

QAPP Worksheet #23: Analytical SOPs
(UFP-QAPP Manual Section 3.2.1)
(EPA 2106-G-05 Section 2.3.4)

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	‡Modified for Project? Y/N
EPA 8270/MLA-021	Analytical Method for the Determination of Polycyclic Aromatic Hydrocarbons (PAH), and Alkylated PAHs and Alkanes. Revision 12.06. December 2018.	Definitive	PAHs	GC-MS	N
EPA 1699/MLA-028	Analytical Procedure for Organochlorine Pesticides by Isotope Dilution HRGC/HRMS by EPA Method 1699. Revision 6.10. May 2018.	Definitive	OC Pesticides	HRGC/HRMS	N
EPA 1668A/MLA-010	Analytical Method for the Determination of 209 PCB Congeners by EPA Method 1668A, EPA Method 1668C or EPA Method CBC01.2. Revision 12.03. April 2019.	Definitive	PCB Congeners	HRGC/HRMS	N
EPA 1613B/MLA-017	Analytical Method for the Determination of Polychlorinated Dibenzodioxins and Dibenzofurans by EPA Methods 1613B, 8290/8290A or DLM02.2.Revision 20.10. July 2017.	Definitive	PCDD/PCDF	HRGC/HRMS	N
EPA SW-846 6020 (Laboratory TBD)	Inductively Coupled Plasma-Mass Spectrometry. July 2014.	Definitive	Metals (no Hg)	ICP-MS	N
EPA 1631 (Laboratory TBD)	Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry. Revision 5. March 15, 2018.	Definitive	Total Mercury	BRI MERX-M Automated Total Mercury CV-GC-AFS Systems	N
EPA 1630 (Laboratory TBD)	Methylmercury Using Distillation, Aqueous Ethylation, Purge and Trap, and Cold Vapor Atomic Fluorescence. August 1998.	Definitive	Methylmercury	Cold vapor atomic fluorescence spectrometry (CVAFS)	N
SM 2540 G Modified	Percent Solids Determination. Revision 6. February 23, 2017.	Definitive	Percent Moisture	Analytical balance, top-loading balance	N
SGS AXYS Laboratory SLA-020	Gravimetric Lipid Determination by Weight of Extract. Revision 07. May 2019.	Definitive	Lipids	Gravimetric	N

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

Instrument	Calibration Procedure	Frequency	Acceptance Criteria	Corrective Action	Title/Position Responsible for Corrective Action	SOP Reference
GC-MS EPA 8270	Initial calibration: 5 points standards	Upon award of the contract, whenever the laboratory takes corrective action which may change or affect the initial calibration criteria, or if the continuing calibration acceptance criteria have not been met	Relative response factor (RRF) ≥ minimum acceptable RRF listed in Table 5 of procedure; All target compounds, initial RSD ≤10% or 20% and correlation coefficient >0.995. %RSD ≤ value listed in Table 5 of procedure	Inspect system for problems (e.g., clean ion source, change the column, service the purge and trap device), correct problem, recalibrate	SGS AXYS Laboratory GC-MS Technician	MLA-021 REV. 12 VER. 06
	Continuing Calibration Verification (CCV)	Once every 12 hours	percent difference ≤15% or <30% as required	Inspect system; correct problem; recalibrate the instrument, reanalyze samples and standards		
	Calibration Standards Verification	Each lot of standards	As per laboratory established control limits	Inspect system; correct problem; rerun standard and affected samples		
	Tuning	Daily: every 12 hours	Response factors and RRF as method specified	Inspect system; correct problem; rerun standard and affected samples		

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Title/Position Responsible for Corrective Action	SOP Reference[1]
HRGC/HRMS EPA 1613B, 1668A & 1699	Initial Calibration and calibration verification check: Per laboratory SOP	After setup, after instrument changes or failures of checks, and every 12 hours	% RSD and percent recovery (%R) per laboratory SOPs	Check, correct; recalibrate and rerun all samples analyzed after last valid calibration check	Laboratory GC-MS technician	MLA-017 REV. 20 VER. 10; MLA-010 REV. 12 VER. 02; and MLA-028 REV. 06 VER. 10
	Calibration checks: CCVs per laboratory SOP	Daily: Every 12 hours	%R per laboratory SOP	Check, correct; recalibrate and rerun all samples analyzed after last valid calibration check		
CVAFS EPA 1630 and 1631	Per method and laboratory SOP	Calibration	Per method/laboratory SOP. Initial calibration (ICAL) ≤15% RSD; 75–125 %R for total Hg; 65–135 %R for methylmercury	Inspect the system, correct problem, recalibrate, and reanalyze samples	Assigned laboratory personnel	TBD
		Initial calibration verification (ICV): Check daily when instrument is in use	85–115 %R for Total Hg; 80–120 %R for methylmercury	Inspect the system, correct problem, recalibrate, and reanalyze samples.	Assigned laboratory personnel	
		CCV: Beginning and after every 10 samples	77–123 %R for total Hg; 67–133 %R for methylmercury			

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Title/Position Responsible for Corrective Action	SOP Reference[1]
ICP-MS EPA SW-846 6020	As per instrument manufacturer's recommended procedures	Initial calibration: daily and each time the instrument is set up. Verify performance daily or once QC checks are noncompliant	r ≥0.998; minimum of 3 standards and a blank	Inspect the system, correct problem, recalibrate, and reanalyze samples	Laboratory or subcontractor ICP-MS technician/ analyst/QA officer	TBD
	Instrument performance check	Daily: after tuning and optimizing instrument	RSD < 5% after at least 4 runs of the tuning solution	Repeat analysis; reprepare calibration standards and reanalyze		
	Initial calibration check – ICV	Before sample analysis	90–110 %R; source of standard separate from calibration standards	Recalibrate instrument; prepare fresh ICV standards; do not analyze samples until problem is fixed		
	Low-Level ICV Standard	After initial calibration verification standard	70–130 %R (concentration ±30% of true value); prepared from calibration standards			
	CCV	Every 10 samples and at end of analytical sequence	90–110 %R; mid-range of ICV standard	Find problem; recalibrate and rerun all samples analyzed after last valid CCV		
	CCV – ISM0.1	Beginning and end of run; 10% frequency or every 2 hours during each run	As per instrument manufacturer's recommended procedures, with at least two standards; a minimum of three replicate integrations are required for data acquisition			
	Low-Level CCV Standard	Beginning and end of run; 10% frequency or every 2 hours during an analysis run	70–130 %R; prepared from calibration standards			

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Title/Position Responsible for Corrective Action	SOP Reference[1]
Analytical Balance	Calibration verification	Daily: before use	0.1% of true value (percent moisture); 1% of true value (lipids)	Clean, level, and tare the balance; repeat procedure; if acceptance criteria is not met, balance must not be used for project samples; correct problem in consultation with laboratory QA staff	Laboratory analyst/QA officer – TBD	TBD
Top-Loading Balance	Calibration verification	Daily: before use	1% of true value	Clean, level, and tare the balance; repeat procedure; if acceptance criteria is not met, balance must not be used for project samples; correct problem in consultation with laboratory QA staff	Laboratory analyst/QA officer – TBD	

Notes:
1. The Field and Analytical Services Teaming Advisory Committee (FASTAC) decision process will be used for procuring laboratory services. CDM Smith subcontract laboratory's calibration and/or method SOPs will be utilized to meet calibration criteria. Specific instrument information (manufacturer and model) is not available at this time.
2. TBD – the reference SOP depends on the laboratory assignment. EPA maintains the CLP laboratory SOP information. For analyses performed by a subcontract laboratory, CDM Smith will obtain relevant SOPs.
3. r represents the correlation coefficient.
4. The laboratory SOP will include the calibration range information.

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.2.3)
(EPA 2106-G-05 Section 2.3.6)

Subcontract laboratories (Katahdin Analytical Services and SGS AXYS Laboratory) will be used for analysis of split samples. Maintenance, testing, and inspection frequencies are documented in the laboratory's SOPs.

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal
(UFP-QAPP Manual Section 3.3)
(EPA 2106-G-05 Section 2.3.3)

Sampling Organization: CDM Smith
Laboratory: Subcontract Laboratory (SGS AXYS Laboratory and Katahdin Analytical Services)
Method of sample delivery (shipper/carrier): FedEx Overnight
Number of days from reporting until sample disposal: LSASD or Subcontract Laboratory – TBD

Activity	Organization and title or position of person responsible for the activity	SOP reference
Sample labeling	CDM Smith FTL	CDM Smith Technical SOP 2-1
COC form completion	CDM Smith sample manager	Technical SOP 1-2
Packaging	CDM Smith sample manager	Technical SOP 1-2 and 2-1; EPA CLP guidance for field samplers
Shipping coordination	CDM Smith FTL, ASC/CLP coordinator	Technical SOP 2-1
Sample receipt, inspection, and log-in	Laboratory custodian (LSASD or subcontract laboratory)	Analytical SOW and laboratory SOP
Sample custody and storage	CDM Smith and laboratories (LSASD or subcontract laboratory)	Technical SOP 1-2; analytical SOW or laboratory technical SOP
Sample disposal	Laboratory custodian (LSASD or subcontract laboratory)	Laboratory technical SOP

Notes:

1. Duplicates will be indicated by adding 100 to the location number. For example, MW1-100-011012 would indicate a duplicate sample collected from MW-1 on January 10, 2012.

QAPP Worksheet #28: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

ORGANICS – Tissue:

- PAHs by EPA 8270 Modified **(28a)**
- Select OC Pesticides by EPA 1699 **(28b)**
- PCB Congeners by 1668A **(28c)**
- PCDD/PCDF by EPA 1613B **(28d)**

INORGANICs – Tissue:

- Metals (Copper and Lead) – ICP-MS by EPA SW-846 6020 **(28e)**
- Trace Mercury by EPA Method 1631 **(28f)**
- Methylmercury by EPA 1630 **(28g)**

GENERAL CHEMISTRY – Tissue:

- Percent Lipid by Method 1613 **(28h)**
- Percent Moisture by SM 2540 G Modified **(28i)**

QAPP Worksheet #28a: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Tissue
Analytical Group PAHs
Analytical Method/SOP Reference EPA 8270 Modified

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	MPC
MB	per extract batch	Per laboratory SOP	Investigate and correct per laboratory SOP	Laboratory Analyst	No analyte > LOQ
Laboratory Duplicate	1 per 20 samples	Per laboratory SOP	Investigate and correct; reanalyze affected samples; flag outliers	Laboratory Analyst	≤20% RPD if target concentration >10 × SDL
MS/MSD	1 per 20 samples or with each group of field samples	Per laboratory SOP	Investigate and correct; document in data summary	Laboratory Analyst	50–200 %R, RPD ≤50%
Surrogate	Every field and QC sample, standards, blanks	Per laboratory SOP	Identify source of problem, make other adjustments and reanalyze	Laboratory Analyst	15–130 %R for labeled compounds (see SOP for individual limits)
Split Samples/Field Duplicates	1 per 20 samples	None	Data assessor to inform SM if MPC is exceeded; address in DQA	CDM Smith ASC	≤40% RPD (for results ≥10 × SDL) or ABS <2 × QL
Temperature Blank	1 per cooler	0–6°C	Note outlier in laboratory narrative; inform CDM Smith of failure and need for additional coolant; check packing procedure	Laboratory Analyst	≤6°C

QAPP Worksheet #28b: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Tissue
Analytical Group Organochlorine Pesticides
Analytical Method/SOP Reference EPA 1699

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	MPC
Split Samples/Field Duplicates	1 per 20 field samples	RPD ≤50% if both results are > 10 × SDL	Evaluate during DV.	Data validation staff	RPD ≤40% if both samples are >10 × SDL
MB	1 per batch (up to 20 samples)	Target Compounds <LOQ	Identify source and attempt to eliminate. Re-extract and/or reanalyze blank and affected samples (if sufficient sample remains). Alert Project Team if repeated or widespread exceedances impact project DQOs. Report results if sample results >5× blank result or sample results not detected.	Laboratory Analyst/Section Supervisor	No target compound > LOQ
Equipment Blank	1 per week per sampling team	Target Compounds < LOQ	Evaluate impacts on data on a case-by-case basis.	Data validation staff	No target Compounds > LOQ
Surrogates	Every sample	Laboratory specified	Check calculations and instrument performance; recalculate; reanalyze.	Laboratory Analyst/Section Supervisor	40–150 %R for labeled compounds, except dieldrin 30–150 %R
OPR	1 per batch (up to 20 samples)	70–130 %R for target analytes, except dieldrin 60–130 %R 40–150 %R for labeled compounds, except dieldrin 30–150 %R 25% of reference values with one exception up to 50%, applicable for values that are 3× the concentration of the lowest calibration point of ICAL	Reprepare and/or reanalyze affected samples. Qualify data as needed.	Laboratory analyst/Section Supervisor Project Chemist/Laboratory Staff	70–130 %R for target analytes, except dieldrin 60–130 %R 40–150 %R for labeled compounds, except dieldrin 30–150 %R
PE Sample	1 per method per year		Provide feedback to laboratory/laboratory reviews data.		25% of reference values with one exception up to 50%, applicable for values that are 3× the concentration of the lowest calibration point of ICAL

QAPP Worksheet #28c: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Tissue
Analytical Group PCB Congeners
Analytical Method/SOP Reference EPA 1668A

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	MPC
MB	1 per 20 samples immediately after OPR	< LOQ or 1/3 PAL unless sample concentrations > 10 × blank levels	If results are nondetected or if lowest sample result is >10 times the blank-no action; otherwise extract and reanalyze or qualify data	Laboratory Analyst	No analyte > LOQ, or 1/3 PAL, whichever is greater
Laboratory Duplicate	1 per 20 samples	± 20% mean for concentrations >10 × SDL	Flag outliers	Laboratory Analyst	RPD ≤40%
CRM or QC Sample	Periodically at least quarterly	25% of reference values with two exceptions up to 50%, applicable for values that are 3× the concentration of the lowest calibration point of ICAL	Check standards; recalibrate if required	Laboratory Analyst	25% of reference values with two exceptions up to 50%, applicable for values that are 3x the concentration of the lowest calibration point of ICAL
Calibration Verification Sample	Beginning of each 12-hour shift	Per laboratory or method SOP	Adjust and/or recalibrate	Laboratory Analyst	70–130% for native analytes and 50–150% for labeled compounds
IPR	Prior to sample analysis	Per laboratory SOP	Investigate and correct	Laboratory Analyst	60–140 %R for target compounds; 20–135 %R for labeled compounds (see SOP for individual limits)
OPR	1 per batch of 20 samples	Per laboratory SOP	Identify source of problem, recalibrate if needed/make other adjustments and reanalyze		50–150 %R for target analytes; 15–140 %R for labeled compounds (see SOP for individual limits)
Labeled Compound Recovery in Samples	Add to each blank, sample, and QC sample preanalysis	15–150 %R (see SOP for individual limits)	Re-extract and reanalyze		15–150 %R (see SOP for individual limits)
Split Samples/Field Duplicates	1 per 20 samples	None	Data assessor to inform SM if MPC is exceeded; address in DQA	CDM Smith ASC	RPD ≤40%; ABS < QL for samples <10 × SDL

QAPP Worksheet #28d: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Tissue
Analytical Group PCDD/PCDF
Analytical Method/SOP Reference EPA 1613B

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	MPC
MB	1 per 20 samples	TCDD/F <0.5 pg/sample, PeCDD/F, HxCDD/F, HpCDD/F <1.0 pg/sample, OCDD/F <5 pg/sample unless sample concentrations > 10 times blank levels (per SOP)	If sample results nondetected or if lowest sample result is >10 × the blank, then no action; otherwise re-extract and reanalyze	Laboratory Analyst	No analyte > LOQ
IPR	Prior to sample analysis	Per laboratory SOP, or method limits	Investigate and correct	Laboratory Analyst	Per method/laboratory SOP
QC Check	Quarterly at a minimum	Per method	Per method	Laboratory Analyst	Per method/laboratory SOP
OPR	1 per batch of 20 samples	70 -130 %R for target analytes and 25–150 %R for labeled compounds	Identify source of problem, make other adjustments; extract if needed and reanalyze	Laboratory Analyst	70–130 %R for target analytes (see SOP for individual limits) and 25–150 %R for labeled compounds
VER	Start of each 12-hour shift	Per laboratory SOP, or method limits	Investigate and correct – repeat analysis	Laboratory Analyst	Individual laboratory established limits per SOP or per method Table 6
Labeled Compounds	Start of each 12-hour shift	Per laboratory SOP	Investigate and correct the problem	Laboratory Analyst	Individual laboratory established limits per SOP; method range for all PCDD/PCDF is 17–197 %R (Table 7 of method)

QAPP Worksheet #28e: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Tissue
Analytical Group TAL Inorganic Metals ICP-MS (Note: laboratory TBD)
Analytical Method/SOP Reference EPA SW-846 6020

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	MPC
MB	Minimum 1 per batch	Result < MRL	All samples associated with a contaminated MB must be reanalyzed	Laboratory Analyst	Laboratory control limit
LCS	Minimum 1 per batch	75–125 %R	If recovery is outside of the control limit, batch must be reprepared and reanalyzed	Laboratory Analyst	Laboratory %R control limits
Matrix Duplicate	Minimum 1 per 10 samples per matrix (mass permitting)	RPD ≤30%	Either redigest the sample batch or flag the results, whichever is appropriate	Laboratory Analyst	Laboratory RPD control limit
MS	Minimum 1 per 10 samples per matrix (mass permitting)	75–125 %R	Either redigest the sample batch or flag the results, whichever is appropriate	Laboratory Analyst	Laboratory %R control limits
CRM	Minimum 1 per batch	Vendor-provided limits	Either redigest the sample batch or flag the results, whichever is appropriate	Laboratory Analyst	Laboratory %R control limits

Notes:
* and ** except when the sample concentration is greater than 10 times the IDL, then disregard the recoveries; no DV action taken
** - (include ABS criteria)
**except when the sample and/or duplicate concentration is less than 5 times the contract required quantification limit (CRQL), then ± CRQL.

QAPP Worksheet #28f: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Tissue
Analytical Group Trace Level Total Mercury (Note: Laboratory TBD)
Analytical Method/SOP Reference EPA 1631

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	MPC
MB	3 per batch	Average MB < 2 × MRL and standard deviation < MDL or <0.1 × the concentration of project samples	Correct problem until criteria are met. All samples associated with a contaminated MB must be reanalyzed or qualified accordingly.	Laboratory Analyst	Laboratory control limit
CRM	1 per batch	75–125 %R	Correct problem prior to continuing analysis.	Laboratory Analyst	Laboratory %R control limits
MS/MSD	1 per 10 samples per matrix (mass permitting)	70–130 %R RPD ≤30%	If recoveries are similar but fail recovery criteria, interference may be present in the sample and the result must be qualified. If RPD criteria are not met, then the system is not in control. Correct problem and reanalyze all associated samples or qualify accordingly.	Laboratory Analyst	Laboratory %R control limits Laboratory RPD control limit

QAPP Worksheet #28g: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Tissue
Analytical Group Methylmercury (Note: Laboratory TBD)
Analytical Method/SOP Reference EPA 1630

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	MPC
MB	4 per batch	Average ≤2 × MDL; SD ≤2/3 MDL or < 1/10 of associated sample concentration	Correct problem. All samples associated with a contaminated MB must be reanalyzed.	Laboratory Analyst	No target analytes at MRL
CRM Material	1 per 20 samples	65–135 %R	Correct problem prior to continuing analysis.	Laboratory Analyst	Laboratory %R control limits
Matrix Duplicate	1 per 10 samples per matrix (mass permitting)	RPD ≤35% or ±2 × MRL if sample < 5 × MRL	If RPD criteria are not met, then the system is not in control. Correct problem and reanalyze all associated samples.	Laboratory Analyst	Laboratory RPD control limit
MS/MSD	1 per 10 samples per matrix (mass permitting)	65–135 %R RPD ≤35%	If recoveries are similar but fail recovery criteria, interference may be present in the sample and the result must be qualified. If RPD are criteria not met, then the system is not in control. Correct problem and reanalyze all associated samples.	Laboratory Analyst	Laboratory %R control limits

Note:

1. Subcontract laboratory criteria are TBD and may differ from the above.

QAPP Worksheet #28h: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Tissue
Analytical Group Percent Lipid
Analytical Method/SOP Reference Method EPA 1613B

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	MPC
Laboratory Duplicate	1 per 20 samples	≤20% RPD	Investigate and correct; reanalyze affected samples. Flag outliers. Document in case narrative.	Laboratory Analyst	≤20% RPD

Note:

1. Subcontract laboratory criteria are TBD and may differ from the above.

QAPP Worksheet #28i: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix Tissue
Analytical Group Percent Moisture
Analytical Method/SOP Reference SM 2540 G Modified

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	MPC
Matrix Duplicate	1 per 20 samples	20% RPD	Reanalyze affected samples. Qualify data as needed.	Laboratory Analyst	Laboratory RPD control limit

Note:

1. Subcontract laboratory criteria are TBD and may differ from the above.

QAPP Worksheet #28k: Analytical Quality Control and Corrective Action (UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6) (EPA 2106-G-05 Section 2.3.5)

PROCEDURE FOR QC SAMPLE COLLECTION

Duplicates: Field duplicate samples are collected and analyzed to assess the overall precision of the field sampling technique. Duplicate samples, of the same matrix, will be collected at a rate of 5% (one per 20 samples) or one per every 14 days or one if less than 20 samples are collected. These duplicates will be submitted "blind" to the laboratories by using sample numbers that differ from their associated environmental samples. For groundwater samples collected during the sampling event, duplicate samples will be collected on a per event basis.

Duplicate samples will be collected by alternately filling bottles for the same analysis.

Cooler Temperature Indicators

One cooler temperature indicator or “temperature blank” will be placed in each cooler containing samples (solid and aqueous) being sent to the laboratory for analysis. The temperature blank will consist of a sample container filled with nonpreserved water (potable or distilled). The container will be labeled “COOLER TEMPERATURE INDICATOR” and dated.

Matrix Spikes

Matrix spikes (MS) are laboratory QC samples drawn from excess volumes of existing samples to demonstrate the accuracy of laboratory analysis. In accordance with EPA Region 2, MSs will be designated on environmental samples at a rate of one per sample delivery group (SDG). This designation will be noted on the sample container labels and the sample paperwork. An SDG is defined as one of the following:

1. All samples of an analytical case if the sample number is less than 20 (including environmental duplicates and QC blanks) and if sampling is completed within 7 calendar days.
2. Each group of 20 samples within an analytical case (including environmental duplicates but excluding QC blanks) if the number is greater than 20.
3. Each 7-day calendar day period during which samples within an analytical case are received. This period begins with the receipt of the first sample in the SDG.

Triple volume may be required for aqueous volatile organic compound (VOC) matrix MS/MSD if a subcontract laboratory is being used and are not required for CLP method SOM02.4. EPA’s LSASD laboratory requires triple volume for aqueous VOC samples. The water quality parameters may require extra volume as identified on Worksheet #19 and confirmed with a non-CLP laboratory.

QAPP Worksheet #29: Project Documents and Records
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

Laboratory Data Deliverables				
Record[1]	**Organics**	**Metals**	**Wet Chemistry**	**Other**
Narrative	X	X	X	X
COC form	X	X	X	X
Summary results	X	X	X	X
Analytical sample results	X	X	X	X
QC results	X	X	X	X
Chromatograms	X	NA	NA	NA
Sample preparation log	X	X	X	X
Sample run log	X	X	X	X
Raw data	X	X	X	X

[1] The records indicated are as-applicable to the oversight effort.

QAPP Worksheet #31, 32 & 33: Assessments and Corrective Action
(UFP-QAPP Manual Sections 4.1.1 and 4.1.2)
(EPA 2106-G-05 Section 2.4 and 2.5.5)

Assessment Type	Number/Frequency	Organization	Responsible Party	Assessment Deliverable and Due Dates	Party to Identify and Implement Corrective Actions	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions
					Title and Organizational Affiliation	
Project Readiness Review	Prior to field work	CDM Smith	FTL	Within 24 hours of review	Remedial investigation task manager (RITM) or PM, CDM Smith	PM, CDM Smith
Sample Collection and Documentation	Once	CDM Smith	FTL	E-mail within 24 hours	RITM or PM, CDM Smith	Jeniffer Oxford (QAS) or field auditor, CDM Smith
QAPP	Annually	CDM Smith	Approved CDM Smith QA Staff or QA Coordinator	E-mail, if required	RITM, CDM Smith	PM, CDM Smith
Data Review	Once	CDM Smith	ASC or Designee	Memorandum based on project requirements	Project Chemist, FTL, or PM depending on nature of issue	PM, CDM Smith

[1] Findings and deviations from plans will require corrective actions that will be documented and discussed appropriately. The EPA RPM will be notified by the PM.
[2] No formal audits will be performed on oversight assignments.

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

Item	Input	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records				
1	QAPP	All planning documents will be available to reviewers to allow reconciliation with planned activities and objectives.	X	X
2	Field SOPs		X	X
3	Laboratory SOPs		X	X
Field Records				
4	Field logbooks	Field notes will be prepared daily by the field team and will be complete, appropriate to the project tasks, and legible. The FTL will review logbooks and records for accuracy and completeness. Upon completion of field work, logbooks and records will be placed in the project files. Field reports will be verified to ensure correct reporting of information. Review will be conducted prior to completion of each report.	X	X
5	Equipment calibration records		X	X
6	COC	Sample manager, FTL, or designee will review the COC forms against the samples packed in each cooler prior to shipment. COCs will be sent with the samples to the laboratory and copies retained for the Trip Report and project files. The data validator will be review upon completion of analytical activities and verified against the laboratory report.	X	X
7	Correspondence	Relevant correspondence will be used to reconcile field records and data.	X	X
8	FCN forms	ASC and data evaluator will review during completion of each data usability assessment/measurement report.	X	X

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

Item	Input	Description	Verification (completeness)	Validation (conformance to specifications)
Analytical Data Package				
9	Laboratory analytical data packages	Laboratory analyst and QA officer will review/verify internally the completeness and technical accuracy of data prior to submittal. All laboratory data will be verified by the laboratory performing the analysis prior to submittal. EPA DV contractor-data validator or CDM Smith data validator will review data packages for content and sample information upon receipt. Data packages will be evaluated for completeness and compliance. Table 9 of the Intergovernmental Data Quality Task Force (IDQTF) UFP-QAPP shows items for compliance review.	X	X
10	Communication records	Relevant correspondence will be used to reconcile analytical data.	X	X
11	Field EDDs	Data Manager will determine whether required EQuIS compatible EDD fields and format were provided.	X	X
12	Outputs of the EQuIS database	Project task leader and team will compile the project data results in a sample project report. Data tables, figures and reported entries will be reviewed/verified against hardcopy information or EQuIS output.	X	X
13	DV reports, audit reports, QAPP, and FCN forms	Data assessor will prepare the project data quality and usability assessment report. The data will be evaluated against project DQOs and MPC, such as completeness. Evaluate whether field sampling procedures were followed with respect to equipment and proper sampling support.	X	X

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Requirement Documents	Records Reviewed	Process Description	Responsible Person /Organization
QAPP, Technical SOP 4-1	Field logbook	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented.	Daily: FTL At conclusion of field activities: project QC staff
SOPs	Field logbook and FCN forms	Ensure that the sampling methods/procedures outlined in QAPP were followed, and that any deviations were noted/approved. Determine potential impacts from noted/approved deviations, in regard to project quality objectives (PQOs).	CDM Smith TM or ASC
QAPP, Technical SOP 1-2	COC forms	Verify the completeness of COC forms. Examine entries for consistency with the field logbook. Check that appropriate methods and sample preservation have been recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for QC samples (e.g., MS/MSD). Verify that all required signatures and dates are present. Check for transcription errors.	Daily: FTL At conclusion of field activities: project chemist or data assessor
QAPP, Technical SOP 1-2	COC forms	Examine traceability of data from sample collection to generation of project reported data. Provides sampling dates and time; verification of sample ID; and QC sample information.	At conclusion of field activities: project QC staff (data coordinator, data validator)
QAPP	Laboratory data package	Examine packages against QAPP and laboratory contract requirements, and against COC forms (e.g., holding times, sample handling, analytical methods, sample ID, data qualifiers, QC samples, etc.). Determine potential impacts from noted/approved deviations, in regard to PQOs.	Environmental Services Assistance Team (ESAT) data validation personnel, EPA Region 2 or CDM Smith data validator

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Requirement Documents	Records Reviewed	Process Description	Responsible Person/Organization
QAPP	Laboratory Deliverable	Verify that the laboratory deliverable contains all records specified in the subcontract SOW. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported according to plan. Compare the data package with the COCs to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. Check for evidence that any required notifications were provided to project personnel as specified in the QAPP. Verify that necessary signatures and dates are present.	Before release: laboratory QAM Upon receipt: project chemist or data validator (ESAT or CDM Smith data validation personnel or ASC)
	Field duplicates	Compare results of field duplicate (or replicate) analyses with RPD criteria.	CDM Smith ASC, data validator, or data assessor
	Methods	Verify that records support implementation of the SOP - sampling and analysis.	
	Data Narrative	Determine deviations from methods and contract and the impact.	
	Field and laboratory data and QC report	A summary of all QC samples and results will be verified for MPC, completeness, and 10% verified to field and laboratory data reports from vendors. A report describing adherence to established criteria shall be prepared within 30 days of data receipt.	

QAPP Worksheet #36: Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Analytical Group/Method	Data deliverable requirements	Analytical specifications	MPC	Percent of data packages to be validated [1]	Percent raw data review/percent of results to recalculate	Validation Procedure[2]	Validation code	Electronic validation program/version	Data Validator
FASTAC Tier 4 (CDM Smith Subcontract Laboratory)									
TAL Metals (ICP-MS)	EQuIS Region 2-Compliant EDD	Worksheet #28, SW-846 6020	Worksheets #12 and 28	100% or as project determined	0%/10%	National Functional Guidelines, modified by Worksheets #12, 15, 19, and 24	S3VM	NA	CDM Smith
Semi-Volatile Organic Compounds, PAHs, Pesticides, PCB Congeners		Worksheet #28, EPA 8270, 1699, 1668A							
PCB Congeners		Worksheet #28, EPA 1668A							
PCDD/PCDF		Worksheet #28, EPA 1613B							
Methylmercury		Worksheet #28, EPA 1630							
Total Mercury		Worksheet #28, EPA 1631							
Percent Moisture		Worksheet #28, SM 2540 G Modified							
Lipids		Worksheet #28, EPA 1613							

Notes:

1. Method requirements will be used to evaluate the data during DV.

QAPP Worksheet #36: Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Validation Code and Label Identifier Table

Validation Code*	Validation Label	Description/Reference	
S1VE	Stage 1 Validation Electronic	Stage 1 Validation - Verification and validation based only on completeness and compliance of sample receipt condition checks.	EPA 540-R-08-005
S1VM	Stage 1 Validation Manual		
S1VEM	Stage 1 Validation Electronic and Manual		
S2aVE	Stage 2a Validation Electronic	Stage 2A Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions and ONLY sample-related QC results.	
S2aVM	Stage 2a Validation Manual		
S2aVEM	Stage 2a Validation Electronic and Manual		
S2bVE	Stage 2b Validation Electronic	Stage 2B Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions and BOTH sample-related and instrument-related QC results.	
S2bVM	Stage 2b Validation Manual		
S2bVEM	Stage 2b Validation Electronic and Manual		
S3VE	Stage 3 Validation Electronic	Stage 3 Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, AND recalculation checks.	
S3VM	Stage 3 Validation Manual		
S3VEM	Stage 3 Validation Electronic and Manual		
S4VE	Stage 4 Validation Electronic	Stage 4 Validation - Verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, recalculation checks, AND the review of actual instrument outputs.	
S4VM	Stage 4 Validation Manual		
S4VEM	Stage 4 Validation Electronic and Manual		
NV	Not Validated		

The following data qualifiers will be applied during DV by a third party. Potential impacts on project DQOs will be discussed in the DV report.

- NM – MPC contained in Worksheet #12 were not met.
- J – The result is an estimated value. The nature of the bias will be discussed in the DV report.
- E – Erroneous result (e.g., improper calculation, peak integration, etc.)
- R – The results has been rejected by the validator.
- U – The result is identified as not detected at the concentration level listed.

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

The data usability assessment process will be summarized to include statistics, equations, and computer algorithms used to analyze the data:

Step 1	**Review the project's objectives and sampling design** Review the key outputs defined during systematic planning (i.e., PQOs or DQOs and MPCs) to make sure they are still applicable. Review the sampling design for consistency with stated objectives. This provides the context for interpreting the data in subsequent steps.
Step 2	**Review the data verification and DV outputs** Review available QA reports, including the data verification and DV reports. Perform basic calculations and summarize the data (using graphs, maps, tables, etc.). Look for patterns, trends, and anomalies (i.e., unexpected results). Review deviations from planned activities (e.g., number and locations of samples, holding time exceedances, damaged samples, noncompliant PT sample results, and SOP deviations) and determine their impacts on the data usability. Evaluate implications of unacceptable QC sample results.
Step 3	**Verify the assumptions of the selected statistical method** Verify whether underlying assumptions for selected statistical methods (if documented in the QAPP) are valid. Common assumptions include the distributional form of the data, data independence, dispersion characteristics, homogeneity, etc. Depending on the robustness of the statistical method, minor deviations from assumptions are usually not critical to statistical analysis and data interpretation. If serious deviations from assumptions are discovered, then another statistical method may need to be selected.
Step 4	**Implement the statistical method** Implement the specified statistical procedures for analyzing the data and review underlying assumptions. For decision projects that involve hypothesis testing (e.g., "concentrations of lead in groundwater are below the action level") consider the consequences for selecting the incorrect alternative; for estimation projects (e.g., establishing a boundary for surface soil contamination), consider the tolerance for uncertainty in measurements.
Step 5	**Document data usability and draw conclusions** Determine if the data can be used as intended, considering implications of deviations and corrective actions. Discuss DQIs. Assess the performance of the sampling design and identify limitations on data use. Update the conceptual site model and document conclusions. Prepare the data usability summary report in the form of text and/or a table.

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

Personnel (organization and position/title) responsible for participating in the data usability assessment: CDM Smith TM, CDM Smith Data Coordinator.

The usability assessment will be documented as follows:
The oversight report will be prepared by CDM Smith personnel, including the TM and DC. The TM will be responsible for preparation of the oversight report and for assigning work to the CDM Smith personnel who will be supporting the assessment, data comparability review, and usability assessment that will be conducted on validated data. The effectiveness of control actions will be evaluated during the laboratory review of the data and the DV, evaluation, and quality assessment process. Data information will be documented in the laboratory narrative, data usability assessment report, and oversight report. The report will include an overall assessment of the CPG analytical data using the results of the split sampling and field oversight, including the field oversight observations of deficiencies and compliance, and an assessment of the split sampling data quality. The following items will be assessed for CDM Smith split samples and conclusions drawn based on their results:

Precision – Split samples will be compared by matrix using the RPD for each pair of results reported above quantitation limits and presented graphically as bivariate scatter plots relative to a 1:1 line and on a table. As appropriate, other statistical determinations may be conducted. Additional information on data handling is included on Worksheet #11.

Results of laboratory duplicates will be assessed during DV, and data will be qualified according to the DV procedures cited on Worksheet #36. RPD acceptance criteria less than or equal to those in this QAPP will be used to assess sampling precision. Absolute difference will be used when one or both results are at or below the QL. An absolute difference of less than five times the QL will be the acceptance criteria. A discussion summarizing the results of laboratory precision and any limitations on the use of the data will be described in the report.

Accuracy/Bias Contamination – Results for all laboratory blanks will be assessed as part of the DV. During the validation process, the validator will qualify the data following the procedures described in Worksheet #36. A discussion summarizing the results of laboratory accuracy and bias based on contamination will be presented and any limitations on the use of the data will be described in the report.

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Overall Accuracy/Bias – The results of instrument calibration and matrix spike recoveries will be reviewed and data will be qualified according to the DV procedures cited on Worksheet #36. A discussion summarizing the results of laboratory accuracy and any limitations on the use of the data will be described.

Sensitivity – Data results will be compared to criteria provided on Worksheet #15. A discussion summarizing any conclusions about sensitivity of the analyses will be presented, and any limitations on the use of the data will be described in the report.

Representativeness – A review of adherence to the sampling plan, field procedures, and project QA audits will be performed in order to assess the representativeness of the sampling program. Data validation narratives also will be reviewed, and any conclusions about the representativeness of the data set will be discussed.

Comparability – The results of this study will be used in conjunction with the CPG data to support the investigation results. The data will be collected, analyzed, and reported in a manner that is comparable to the CPG data set. The RPD between CDM Smith and CPG data will be calculated.

Completeness – A completeness check will be done on the analytical data generated by the laboratories. Completeness will be calculated for each analyte and compared to the project completeness goal of 90%. For sampling, completeness will be calculated as the number of samples accepted and analyzed divided by the number of samples planned for acceptance. For each analyte, completeness will also be calculated as the number of data points that meet MPC divided by the total number of data points for that analyte. A discussion summarizing the results of project completeness and any limitations on the use of the data will be described in the report.

Reconciliation – The DQIs presented in Worksheet #12 will be examined to determine if the MPCs were met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of major impacts observed from DV, DQIs, and MPC assessments. Based on the results of these assessments, the quality of the data will be determined. As a result of the quality determined, the usability of the data for each analysis will be established. After the combined usability of the data from all analyses for an objective is determined, it will be concluded if the DQIs were met and whether project goals were achieved. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

Data validation reports will be reviewed to determine the quality of the data and potential impacts on data usability. Field duplicates will be evaluated against the MPCs outlined in worksheet #12. Noncompliant data will be discussed in the usability report. The following equations will be used:

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1. To calculate field duplicate precision:

RPD = 100 × 2 |X1 − X2 | / (X1 + X2), where X1 and X2 are the reported concentrations for each duplicate or replicate

2. To calculate completeness:

% Completeness = V/n × 100, where V= number of measurements judged valid; n = total number of measurements made and
% Completeness = C/X × 100, where C= number of samples collected; X = total number of measurements planned

The results will be evaluated using temporal and spatial relationships of the data. This activity will be performed during the data usability evaluation and oversight reporting. Not all "J" qualified data are usable, so all lines of evidence to support data use will be evaluated. Although "J" data are reasonable for use, CDM Smith will document the evaluation of all qualified results against the values, data quality, and bias of surrounding data. If needed, qualified results at plume edges will be mapped and evaluated. Validated results will be further examined during data evaluation and recoded in accordance with EPA Region 2 directives.

For qualified results that are outliers or at the edge of contaminated areas:

a) Discuss how data outliers will be addressed
b) Evaluate against all issues such as geology, hydrogeology, depth, past history
c) Consider whether qualified data are reasonable based on surrounding data (e.g., data qualified due to missed holding time may be lower than we expect)
d) Address data quality bias and reason for qualification
e) Evaluate effect of data qualification on the data

The investigation results will be presented in tables and figures and in the text of the oversight report. Data gaps will be evaluated if requested by USACE or EPA. The report will discuss the completeness of the planned and collected data and the effect on the data objective of evaluating the accuracy of the CPG data.